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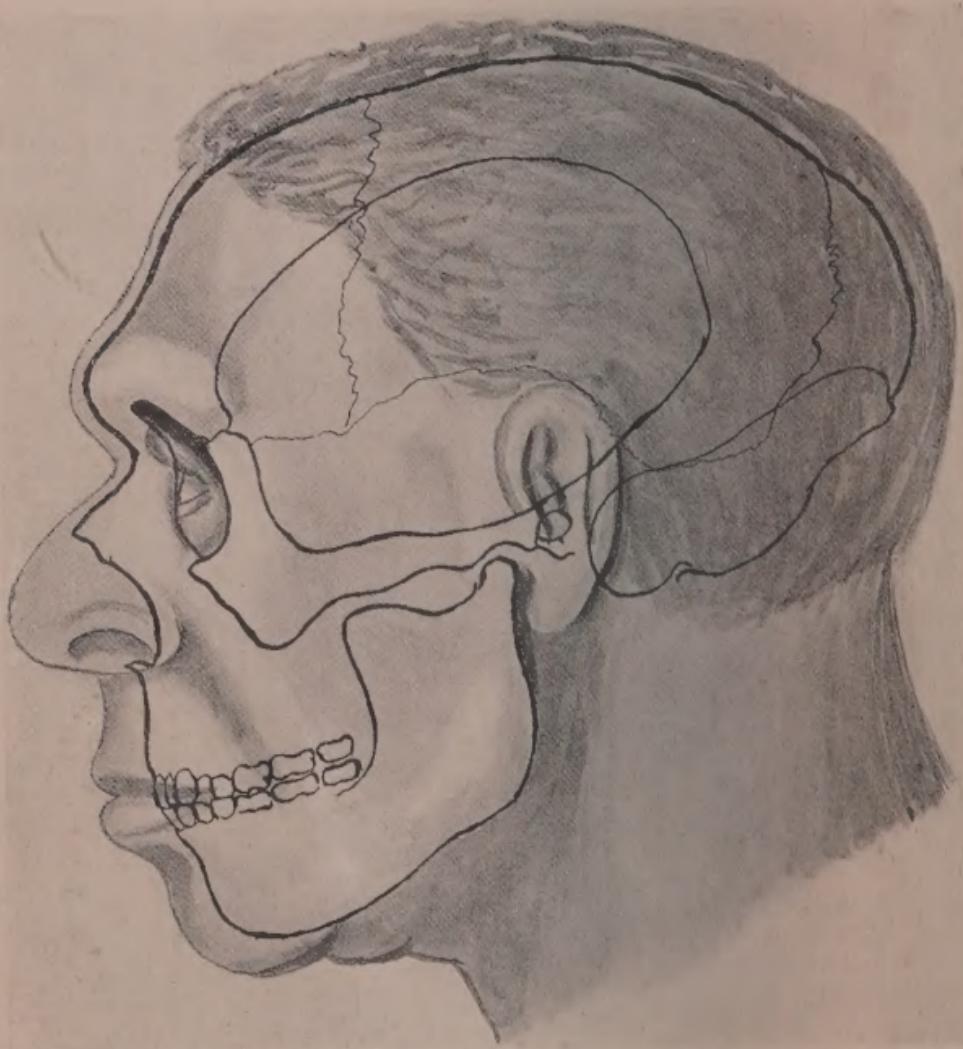
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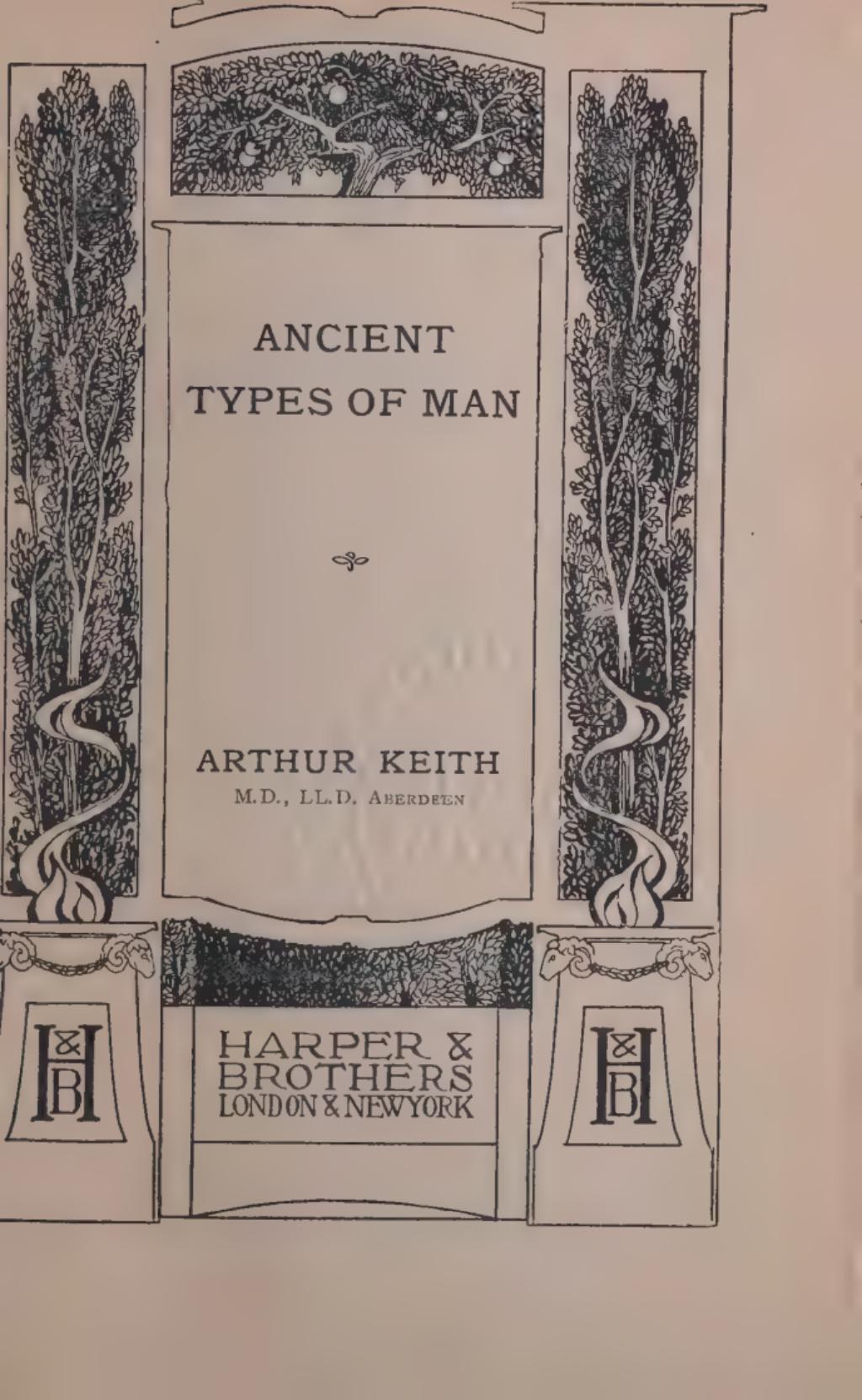
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Reconstruction of the Head of the Gibraltar Man.
(One-third natural size.)



ANCIENT TYPES OF MAN



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ANCIENT TYPES OF MAN

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INTRODUCTORY

H.C.F. —

IN this little book the author has tried to give the chief conclusions he has reached after a prolonged study of the remains of ancient man. The reader will find that the scale of time which answers so well for present-day affairs will scarcely serve him when he comes to place ancient man in his proper perspective in the past. Instead of reckoning from a date which is dear to a large part of the world, viz. the Birth of Christ, he must begin at the present time and count steadily backwards into the past. The METALLIC period is the first, one in which men have used copper, bronze, and iron—a period which we suppose to extend about 4000 years back. The metallic period was preceded by one in which Europeans used finely worked stones as implements, and hence it is usually named the NEOLITHIC PERIOD. It is a long period, probably six times as long as the metallic; it may be fixed provisionally at 25,000 years, but it was very probably much longer than that.

Beyond the Neolithic Period we enter the LATE PALEOLITHIC Period—one which extended from the Neolithic Period to the end of the Ice

INTRODUCTORY

Age; the length of this period is estimated provisionally at about 150,000 years. On entering the Late Paleolithic Period the stone implements used by Europeans are seen to be of a more massive and rather rougher type of workmanship. Animals were then living in Central and South Europe which have disappeared—the reindeer and the mammoth. The period just named falls within the latter part of the geologists' Pleistocene Period.

The Late Paleolithic Period was preceded by the **EARLY PALEOLITHIC PERIOD**, one of very great but uncertain length. It lies within the glacial period, which was broken by at least three temperate intervals. The Early Paleolithic Period probably covers the last two of these intervals. Its duration is variously estimated from 200,000 to 400,000 years. At the beginning of this period the dominant race of Europe was the Neanderthal type of man; at its close Europeans were of the modern type.

Beyond the Early Paleolithic Age is another stone period—the **EOLITHIC**, one in which man used crudely fashioned flints to serve his various needs. This period is assigned provisionally to the first of the interglacial periods, and carries us back to the beginning of the Pleistocene Period. To the Eolithic Period a duration of 100,000 to 150,000 years is assigned.

The Eolithic and Paleolithic Periods of the Anthropologist correspond roughly to the Pleisto-

INTRODUCTORY

cene of the Geologist. The duration of the Pleistocene is estimated here at from 450,000 to 700,000 years, but it is right to state that a much higher figure is given by most authorities. The reader will see that the estimates are little better than guesses, but it is only by making such rough calculations that we may hope to obtain the facts on which a more certain estimate may be built.

Beyond the Pleistocene we enter the PLIOCENE PERIOD of the earth's History. Whether or not we have found the remains of Pliocene man is a question still open to debate, but the reader will find the problem discussed in the chapter which deals with the Fossil Man of Java.

All the illustrations are drawn from actual specimens by a method employed by the author, who is indebted to Mr. William Finerty for accurately reproducing the original drawings in a more finished form.

A. KEITH.

ROYAL COLLEGE OF SURGEONS, ENGLAND.

September, 1911.

CONTENTS

CHAPTER	PAGE
I. AN ANCIENT ENGLISH TYPE FROM ESSEX	I
II. THE TILBURY MAN	10
III. THE DARTFORD TYPE	22
IV. THE GALLEY HILL MAN. THE OLDEST HUMAN REMAINS YET FOUND IN ENGLAND	28
V. THE MEN OF BRÜNN AND COMBE- CAPELLE	46
VI. THE GRIMALDI OR NEGROID TYPE IN EUROPE	59
VII. AN ANCIENT RACE OF TALL MEN: THE CRO-MAGNON	64
VIII. THE ROUND-HEADED TYPE	74
IX. HEIDELBERG MAN	78
X. KRAPINA MEN	94

CONTENTS

CHAPTER		PAGE
XI.	NEANDERTHAL MAN	101
XII.	NEANDERTHAL MAN IN BELGIUM AND FRANCE	109
XIII.	GIBRALTAR MAN	121
XIV.	FOSSIL MAN OF JAVA—PITHECAN- THROPUS ERECTUS	131
XV.	ANCIENT TYPES OF AMERICA	141

LIST OF ILLUSTRATIONS

Reconstruction of the Head of the Gibraltar Man *Frontispiece*

FIGURE	PAGE
1. Diagrammatic Section of Coast Line, showing exposure of prehistoric surface, with position of the skeleton	2
2. Profile of the Skull of the Essex Woman, with soft parts indicated. (One-third natural size.)	5
3. Section of the strata at Tilbury	11
4. Profile of the cranium of the Tilbury Man. (One-third natural size.)	18
5. Diagrammatic section across the Thames Valley to show the terraces and buried river bed	23
6. Profile of the Dartford cranium compared with the "river-bed" type found in Langwith Cave. (One-third natural size.)	25
7. Profile of the skull of the Galley Hill Man	36
8. Galley Hill skull—full face. (One-third natural size.)	38
9. The profile of the Brünn and Galley Hill skulls. (One-third natural size.)	48
10. Section of the strata in which the ancient human remains were found at Combe-Capelle	52
11. Profile of the skull of the Combe-Capelle Man compared with the profile of the Galley Hill Man. (One-third natural size.)	55

LIST OF ILLUSTRATIONS

FIGURE	PAGE
12. The site of the discovery of the Cro-Magnon Race. The foreground represents a section. A—Limestone Cliff. B—Ledge overhanging the Ancient Shelter. C—Débris fallen from the cliff in which the remains were found. D—Alluvium. (After Quatrefages.)	65
13. Profile of a Cro-Magnon skull with the outline of the Dartford cranium traced on it. (One-third natural size.)	68
14. Face view of the Cro-Magnon Race. (One-third natural size.)	70
15. A diagram of the strata of the pit in which the Heidelberg mandible was found. A cross marks the spot. (After Schoetensack.)	80
16. Profile drawing of the Heidelberg mandible (in outline) contrasted with the lower jaw of a Modern European (shaded). (Half natural size).	82
17. Profile of the Heidelberg mandible (outline) contrasted with that of the mandible of a chimpanzee (shaded). (Half natural size.).	84
18. Heidelberg mandible with attempted reconstruction of the head. (One-third natural size.)	89
19. Profiles of the Heidelberg (outline) and Spy (shaded) mandibles superimposed for comparison. (Half natural size.)	91
20. Outline of Neanderthal form of skull (shaded) compared with the Galley Hill type (outline). (One-third natural size.)	103
21. Thigh bone of Neanderthal (outline) and modern man (shaded) contrasted. (One-fifth natural size.)	106
22. Section of the strata in which the skeleton was found at Ferrassie	114

LIST OF ILLUSTRATIONS

FIGURE**PAGE**

23. Section of a talus or terrace at Gibraltar of similar formation to the one in which the famous skull was found. (H. D. Acland.)	123
24. Profile of the Gibraltar cranium (shaded) compared with modern English skull (outline). (One-third natural size.)	126
25. Face view of the Gibraltar skull. (One-third natural size.)	128
26. Profile of Gibraltar skull. (One-third natural size.)	129
27. Section of the bank of the Bengawan, showing the position of the fossil-bearing stratum in which the remains of the fossil man were found	132
28. The profile of the calvaria of the fossil man of Java (shaded) compared with the Gibraltar cranium (outline). (One-third natural size.)	135
29. A tracing of the profile of the La Tigra cranium (outline) compared with the profile of the skull of the Arkansas loess man (shaded). (One-third natural size.)	145



ANCIENT TYPES OF MAN

CHAPTER I

AN ANCIENT ENGLISH TYPE FROM ESSEX

AS I sit down to write the story of the various forms which the body of man has assumed in ancient times, I find it difficult to determine whether I should begin at the beginning, or at the end. Were the story now complete, there would be no difficulty ; it should be told from the beginning. Some day, no doubt, it will be told thus, but at present the known phases of man's early history are so few, so fragmentary and so isolated, that a survey of the later and better known phases is needed to place the earlier stages in their proper perspective. For that reason, I propose to reverse the usual order, and trace man's physical history from the present into the far past.

The individual selected as the first type is one discovered in 1910 on the coast of Essex, near Walton-on-Naze, some fifty miles north of the estuary of the Thames. The sea there washes

ANCIENT TYPES OF MAN

against a flat coast-line, cutting into and exposing on the beach remains of a buried or prehistoric floor containing many worked flints. Over this prehistoric floor is a stratum—8 to 10 feet in depth—of clay. The prehistoric floor, now being

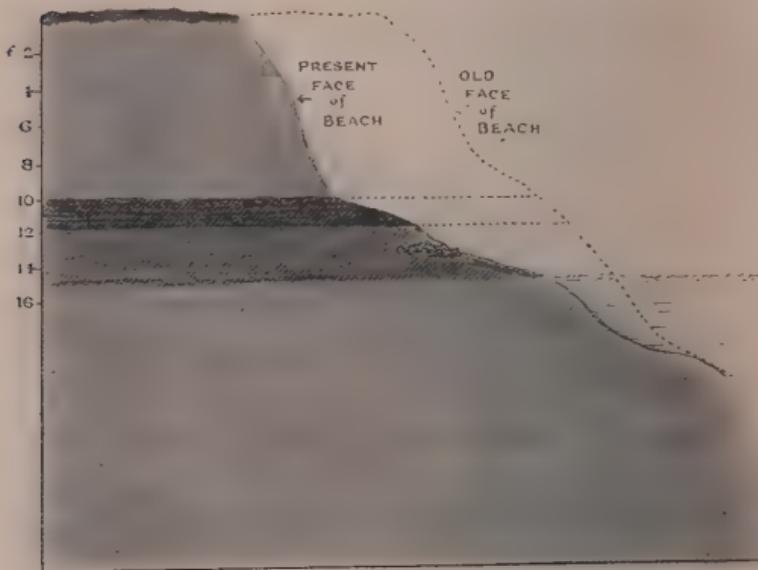


Fig. 1. Diagrammatic Section of Coast Line, showing exposure of prehistoric surface, with position of the skeleton.

exposed by the tide, has been closely studied by Mr. Hazzeldine Warren. It was at one time dry land, on which men lived and worked. The number of years which has passed since then may be roughly guessed. Flints of the finished or Neolithic type, certain forms of pottery, and

AN ENGLISH TYPE FROM ESSEX

also traces of the foundations of dwellings and of hearths are found, from which we infer that this floor must be assigned to the end of the Neolithic, or commencement of the Bronze Age. In round numbers, about 4000 years ago. We infer, then, that the east coast of Essex has been slowly sinking, the prehistoric surface being partly submerged by the sea, and partly buried beneath a deep layer of rain-washed clay, which has been deposited over it, thus preserving for us the traces of a bygone civilization. Beneath this prehistoric floor Mr. Warren has found traces of an older civilization.

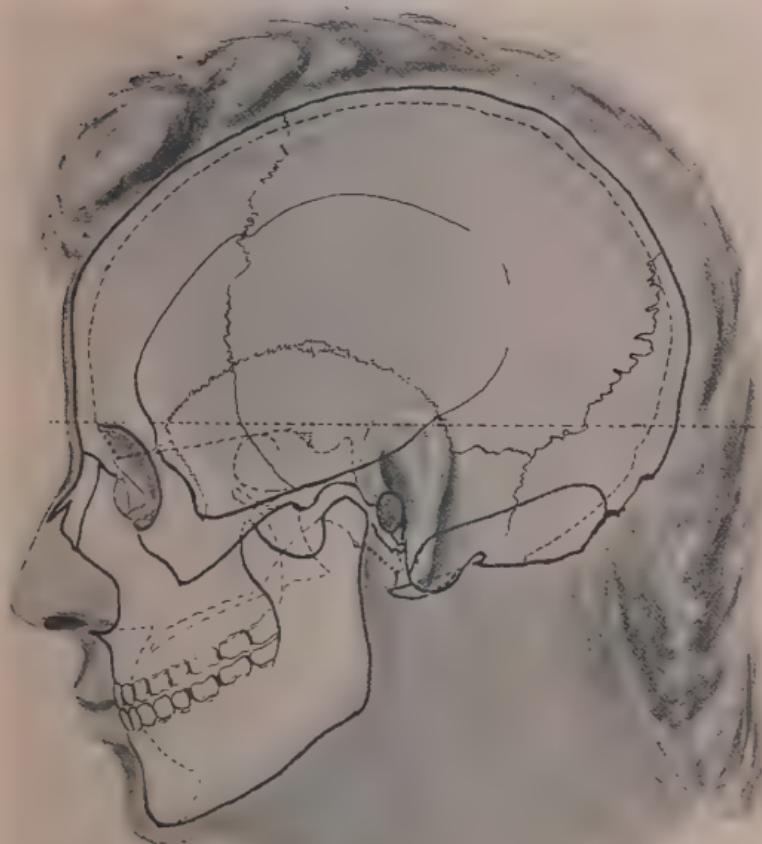
On a September afternoon of 1910 Mr. Hazzel-dine Warren and his companion, Mr. Miller Christy, were searching the beach for washed-out flints, when they found that the tide had exposed—2 feet below the prehistoric floor and 12 feet below the surface of the original coast-line—the leg of a human skeleton. Setting to work, they quickly exposed a complete human skeleton, lying on its left side, with the face to the east and the head to the north. It was in the “contracted posture,” the limbs having been bound closely to the body by grass ropes, remnants of which were found. Inside the ribs was found a *heap*—nearly a pint—of fruit seeds of the blackberry and dog-rose. That discovery throws light on the nature of the diet and the season of the year when death overtook this individual. Clearly, too, it was a burial,

ANCIENT TYPES OF MAN

not the chance interment which overtakes those who find a last bed in the sea or the river. Nor could it have been a burial made in recent times, for until the other day the grave lay twelve feet below the surface. The grave was at least as old, and perhaps older, than the prehistoric floor. The skeleton was permeated by the fine clay and sand in which it lay, and so wonderfully preserved that a very complete picture can be formed of the person in life. We have here a specimen of a Late Neolithic Briton.

It seems almost ridiculous to have to admit that there was at first some difficulty in determining the sex of the individual thus discovered. In life even an infant can tell a man from a woman, but when there is only the skeleton, the most expert anatomist sometimes feels a difficulty. As a rule the pelvis, because it is so closely connected with the functions of child-bearing, provides the most certain grounds. In the present case, the evidence of the pelvis was equivocal ; its characters were more those of a man than of a woman, yet when its breadth was compared with that of the chest, a marked female character was recognized : it was decidedly wider than the chest, whereas in man the chest is usually wider than the lower, or pelvic, part of the body. The muscular attachments to the base of the skull showed the delicate tapering neck of the woman ; the skull itself was in all its features feminine. The bones

AN ENGLISH TYPE FROM ESSEX



ESSEX

Fig. 2. Profile of the Skull of the Essex Woman, with soft parts indicated. (One-third natural size.)

ANCIENT TYPES OF MAN

were delicately moulded, the face was of the narrow oval type so much admired in modern times; the nose was narrow and finely moulded. The hands and feet were small, the bones of the limbs slender and rather short, as compared to the length of the body. The skeleton is clearly that of a woman, with the lower part of the body rather contracted and straight—not an uncommon type.

Although 5 ft. 4 in. in height, rather above the modern average, her slenderness must have made her appear tall. At the time of death she was about twenty-five years of age, for there was evidence that the growth lines of her long bones had recently closed, and all the sutures of the skull were open and the bones thin. Her head was well moulded and poised and comparatively small. The cavity for the brain measured 1260 cubic centimetres, which, although quite as large as many modern women of her build, is yet 40 cc. below the modern female average.

With her relatively small, well-poised head and regular features, this woman, were she to appear in a modern assembly, would still pass as a good representative of her sex and race. Four thousand years seem to have worked comparatively little change in the best type of British woman. In head-form she might represent the students now attending the Women's School of Medicine, London. Mr. F. G. Parsons measured

AN ENGLISH TYPE FROM ESSEX

fifty of these and found the average length of head to be 175 mm.—one mm. less than in the ancient Essex woman; the greatest width of head was the same in both, viz. 137 mm.; the height of the head above the ear-holes was almost the same, viz. 117 mm. in the modern women students of medicine and 116 mm. in the Neolithic woman. Thus, not only the absolute dimensions, but the relative proportions are almost the same, the width of the head being about 78 per cent of the length in both. They occupy a position intermediate to the long and narrow heads (dolichocephalic), which we shall meet with in very ancient times in Britain, and the extremely short and wide (brachycephalic) heads found in Central Europe now.

If time has altered but little the general type of English woman since Neolithic times, it has affected some of her features. In the Essex woman, not one of the thirty-two teeth—the zoologist names them permanent teeth—was lost by disease or accident. The teeth were regularly placed and the palate was well formed, whereas to-day in more than fifty per cent of women, the palate is apt to be contracted in width and the teeth irregularly placed. We blame our food and our modern conditions of life for these defects, but while we blame them, we do not quite understand how they produce these effects on the palate, and nose, and teeth. We can see very plainly

ANCIENT TYPES OF MAN

that the act of mastication has altered. In the great majority of modern British people, the lower incisor teeth pass up behind the crowns of the upper, when the jaw is closed in chewing ; in the Essex woman, as in the majority of Neolithic people and as in modern native races, the incisor teeth meet edge to edge. Our modern teeth are used merely for crushing food, very little side to side grinding movement taking place ; indeed, as the lower incisors pass behind the upper they become locked, and little side to side movement is possible. The edge to edge bite in Neolithic man allowed the most free side to side grinding movement. This movement, combined with the roughness or grittiness of the food led to the crowns of the teeth being worn down in a manner not seen in modern British teeth. In Neolithic man the hard surface enamel was worn off the crowns, thus exposing the dentine which forms the main body of the tooth. The sensitive pulp was rarely exposed in the teeth of Neolithic man, because the dentine reacted to the grinding movement and filled the pulp cavity. Although only about twenty-five years of age, the teeth of the Essex woman show the dentine already freely exposed on their grinding surfaces. The well-developed jaws, and various markings on the skull, point to large-sized muscles of mastication. The seeds of wild fruits indicate the nature of the diet ; we know, too, that the Neolithic people had their

AN ENGLISH TYPE FROM ESSEX

corn-patches, their querns for grinding, their flocks and their looms. In every sense of the term they were a civilized people. Their fare, if rough, was evidently suited to a healthy development of the teeth, mouth, throat, and nose. The retrograde changes in the teeth, palate, and nose are the most remarkable, and, from a medical point of view, the most important evolutionary changes seen in the body of man in recent times.

One other feature of the Essex woman deserves a brief mention. The bones of her right arm show a high degree of specialization ; she was not only right-handed, but the contour of the shoulder joint, the muscular impressions of the humerus, and the shape of the forearm bones show clearly that she was engaged in some occupation which required the constant repetition of a set of right-arm movements. Whether these were connected with the loom or the quern it is impossible to say ; whether a lady of high degree, or merely a handmaiden, she had her daily round of specialized toil.

CHAPTER II

THE TILBURY MAN

LEAVING the east coast of Essex, I propose to conduct the reader to the valley of the Thames, and introduce a man who lived there many thousands of years before the Essex woman was born. This individual came to light under the following circumstances. About half-way between London and the sea there is a stretch of flat marshy land on the north bank of the Thames, where now the Tilbury Docks are situated. In 1883, when they were excavated, a great bed of stratified sand was reached at a depth of 31 feet below the marsh surface. In the upper layer of the sand-stratum were found pieces of decayed and blackened wood and other objects which showed that at a remote period the sand bed had formed the exposed shore or bank of the Thames. About 3 feet below this ancient surface, and 34 feet below the present marsh level, was found the fragmentary skeleton of a man. From the fact that the whole skeleton was represented, and that it was found below an old surface, we may presume, as in the last case, that there had been a

THE TILBURY MAN

burial, but no observation was made on the position of parts nor were any traces of man's handiwork found. Whether his implements were of the rough and very ancient Paleolithic form, or

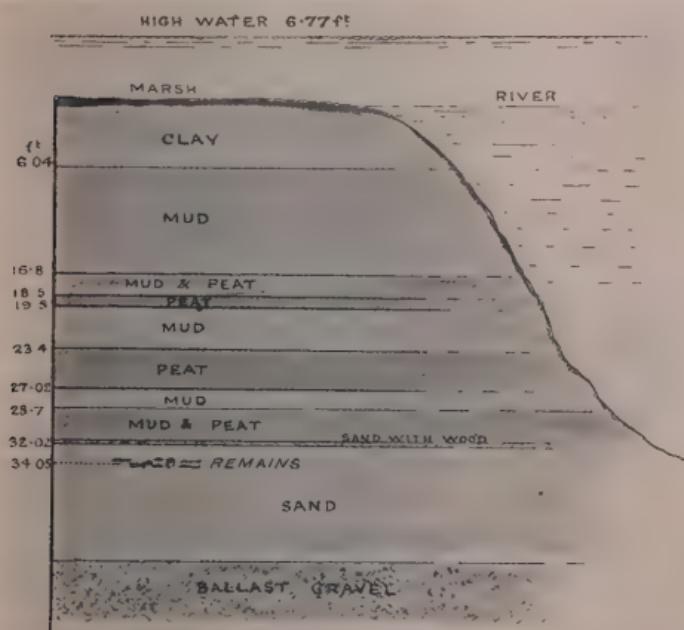


Fig. 3. Section of the strata at Tilbury.

of the more recent and finer Neolithic type, we do not know; nor are we certain of the animals that then inhabited the Thames Valley; but from evidence to be produced the Tilbury man may be provisionally assigned to the beginning of the Neolithic period.

ANCIENT TYPES OF MAN

It is impossible to frame in years any accurate estimate of the period that has elapsed since the Tilbury man was alive, but at least a period of 30,000 years seems necessary to account for the great changes which have occurred in the lower Thames Valley since he was buried in a stratum which now lies 34 feet below the surface of the land. We have seen that a prehistoric stratum on the east coast of Essex, which is estimated to be 4000 years old, has been submerged and buried beneath a layer of clay varying from 8 to 10 feet in thickness. If the Thames Valley had been submerged at the same rate—2 feet in a thousand years—then the Tilbury prehistoric stratum would have an antiquity of only 15,000 years. There are reasons for supposing the submergence in the Thames Valley, with a corresponding formation of land over the sinking surface, to have occurred at a much slower rate. No evidence has been found of any appreciable change in the level or contour of the banks of the lower Thames during the last 2000 years. Since the Roman invasion of England there seems to have been little or no subsidence in this region, yet it is possible that changes have taken place more rapidly in remote periods ; but there is no positive evidence that bears out this supposition. The nature of the strata which have been found over the prehistoric surface at Tilbury indicates that the land changes have taken place very gradually. Immediately

THE TILBURY MAN

over the buried surface have been formed 15 feet of alternate layers of peat and mud, strata which indicate a low rate of subsidence. (Fig. 3.) Over the mud-peat layers are strata of mud and clay 16 feet in thickness. A subsidence of 31 feet, with the formation of strata of peat, mud, and clay, implies an enormous change in physical characters of the lower valley of the Thames. When fuller and more accurate evidence as to the rate of depression has been accumulated, it will probably be found that on an average a subsidence of a foot for every 1000 years is a high rather than a low estimate. At least it will be apparent, when we come to examine the characters of the skeleton discovered at Tilbury beneath 31 feet of strata, that whether the period be 15,000 or 30,000 of years, the physical characters of the Thames Valley have changed infinitely more than those of its inhabitants.

It is a fortunate circumstance that the discovery of the Tilbury remains was made at a time when the questions relating to man's antiquity were being discussed and the importance of such finds as historical documents realized. The remains were examined by the veteran zoologist, Sir Richard Owen, then approaching his eightieth year, who published a description of them. They are now preserved in the British Natural History Museum, South Kensington, where visitors may examine to-day the broken skull cap, the lower jaw, the fragmentary bones of the limbs and

ANCIENT TYPES OF MAN

body and turn aside from them, I fear, little realizing their significance. Their importance lies in this, that these broken human bones, when carefully examined and compared with modern specimens, as I have had lately the privilege of doing, show us that a type of man, similar in stature and formation, still exists in Britain. He has remained unchanged during the thousands of years that have elapsed since the Tilbury man walked on a surface which lies 30 feet and more below that on which the Roman soldiers marched. In Owen's time those scientists who had come, under Darwin's influence, to believe in the evolution of man, expected to find in an individual so ancient as the Tilbury man some distinct trace of his Simian origin. That was because there was then in human thought an erroneous idea of the antiquity of man's origin ; his antiquity was then measured by a few thousand years.

So far as the physical appearance of the Tilbury man is concerned, he might be one of us ; he belongs in all his features to the modern type. It would mean little to the reader were I to compare him to the average Briton of to-day. We British, like every nation under the sun, are a diverse people, showing great variation in our stature and proportion of limbs, in our form of head and face, and in our general mental disposition. It seems better, for the purpose of com-

THE TILBURY MAN

parison, to take an individual—and the one I select is a notorious Englishman of the eighteenth century, who, after a life of crime, was hanged, and had his skeleton handed down to posterity in the celebrated Museum of the Royal College of Surgeons, England, to the great benefit of many generations of medical students. This Jonathan Wilde has a thigh bone 447 mm. long and a stature of 1632 mm. (5 ft. 4·2 in.) nearly 4 inches below the average stature. The length of the Tilbury man's thigh bone is almost the same as that of Jonathan Wilde, his leg bone, or tibia, is slightly longer, so we may infer that his stature was also approximately the same. The bones of the upper limb of the Tilbury man are fragmentary, so that their precise length cannot be determined; but in thickness and apparently in length they agree closely with those of his ill-starred countryman. There is one feature, however, in which they differ, and that is in the shape of the tibia, or shin-bone. In the Tilbury man the shaft of the tibia is flattened from side to side, almost like a razor, so that the width is only 55 per cent of the front to back diameter; in Jonathan Wilde, as in nearly all modern Europeans, it is prismatic in section, the width being 62 per cent of its front to back thickness. In spite of much research, it must be owned that we do not rightly understand the meaning of flattening of the tibia; its disappearance in modern races is somehow connected with posture and gait. All

ANCIENT TYPES OF MAN

we do know for certain is that it is not an ape-like feature, and that it was a character found in all races of the Neolithic or later stone period of culture, not only in England, but in Europe generally. It occurred also in the prehistoric tribes of the United States. It may be added that of the two individuals compared here, Jonathan Wilde's bones are rather the thicker, and stouter, showing marks of a fuller muscular development.

In shape and size of head, too, there is a close agreement between the ancient and modern individuals compared here, so close that we cannot doubt they are of the same race. In both, the head is of moderate size ; they would have taken a $6\frac{1}{2}$ fitting in hats. The greatest length of the head in the Tilbury man is 186 mm., its greatest width 141 mm., its height, estimated from the probable position of the ear passage, about 115 mm.; the corresponding measurements in Jonathan Wilde are 185, 134, 112 mm., the latter having a rather narrower and lower head. The capacity of the cranial chamber in Jonathan Wilde is 1425 cubic centimetres, in the Tilbury man it was probably considerably more—about 1500 cc., somewhat above the average capacity of the Englishman of to-day. If we take into count, as we ought to in estimating the size of the brain, the stature and bulk of body, then we must admit that the size of brain in the Tilbury man is relatively greater than in the average man of to-day. If we seek to

THE TILBURY MAN

express the shape of head by stating the proportion of breadth to that of length, then the cephalic or breadth index of the Tilbury man is 75.8, that of Jonathan Wilde, 72.4—the head of the latter being distinctly narrower or more dolichocephalic. How closely the Tilbury man agrees in size and shape of head with modern Englishmen may be seen from recent researches of Mr. F. G. Parsons. In a collection of crania belonging to men who lived near Rothwell, Northamptonshire, about the time of the Reformation, Mr. Parsons found the average dimensions to be much the same as in the Tilbury man. In the Rothwell men the average length of the skull is the same as in the Tilbury, viz. 186 mm.; the average breadth was almost the same, 142 mm., so that the cephalic index is also the same. Historians have led us to believe that in comparatively recent centuries invasions of Jutes, of Saxons, and of Danes completely replaced the ancient Britons. Here, then, is an important fact that very many thousands of years before written history begins, and far beyond our most enduring traditions, there existed in the valley of the Thames, when the river flowed in a channel more than 30 feet below its present level, a man who, in stature and in head form, is plentifully represented amongst Englishmen of to-day.

Although all the parts of the face between the forehead and the mouth of the Tilbury man have

ANCIENT TYPES OF MAN

decayed and are thus lost to us, enough of the mandible was found to assure us that in propor-

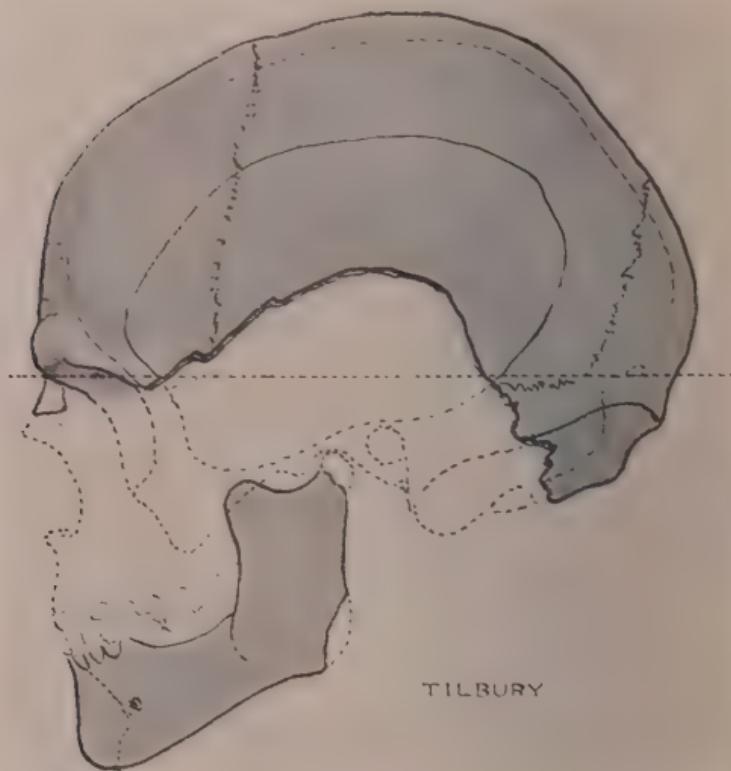


Fig. 4 Profile of the cranium of the Tilbury Man.
(One third natural size.)

tions and in type his face was very similar to that of Jonathan Wilde. Beyond the circumstances under which the skeleton was found there is no evidence in its shape and characters of its great

THE TILBURY MAN

antiquity. The chin is pronounced ; the markings on it for the muscles of the tongue and mouth, muscles closely concerned in speech, show that these parts were used in the same manner as to-day. We cannot say what his language may have been, but we can be certain he spoke. We know, too, he was not a young man ; the degree to which the bones of the skull have fused together shows that he had long passed the meridian of life. His skeleton shows no traces of disease, or of rheumatic changes. One point rather surprises us ; in nearly all the specimens of very ancient man that have been discovered, the teeth, although worn with age to the sockets, are rarely lost, or show signs of disease. Here, however, all the back teeth have been lost during life. The three front teeth preserved—an incisor, a canine, and a premolar—are all much worn and their pulp cavities filled up by a reaction caused by hard use. As regards size and shape they do not differ from modern teeth, nor do the dimensions of the palate suggest a development of jaws or of dentition in any way different from Britons of the Neolithic Period.

To what race of mankind did the Tilbury man belong ? He is abundantly represented in the population of modern England. To what race, when we see this type of man in the flesh to-day do we assign him ? He and his successors are ancient British, if you will, but it is better to follow the example of the sharp-sighted Huxley

ANCIENT TYPES OF MAN

and speak of a type rather than of a race. In 1862, twenty-one years before the Tilbury man was discovered, Huxley had recognized and described a form of prehistoric skull found in England under the name of the "river-bed" type. The Tilbury cranium is of the river-bed type. The actual specimens described by Huxley are still in the Museum of the Royal College of Surgeons, England; one is from an old bed of the River Trent, near Muskham; another is from a Dolmen in Anglesey. Lately another of this type was discovered by the Rev. E. H. Mullins in the floor of a cave in Derbyshire, with bones of the reindeer, and other animals long extinct in England. Indeed, this specimen of the river-bed type from the Langwith cave deserves fuller mention, for that able scientist, Mr. Martin A. C. Hinton, regards the fauna found with this skull as of the Pleistocene¹ Period, and therefore much older than the Tilbury specimen. Another of the same type, also in the Museum of the Royal College of Surgeons, was found beneath a layer of peat and 15 feet of blue clay when a railway cutting was made in Gloucester. The skull found beneath the limestone deposit of Gough's cave at Cheddar, Somerset, is also of the river-bed type. All of these are usually assigned to the Neolithic Period,

¹ Pleistocene, the geological period preceding the present one. The strata formed during that period are characterized by containing many extinct species of mammals.

THE TILBURY MAN

and represent the prevailing type of Englishman at the commencement of that period and probably also in the latter part of the Paleolithic Period. The skulls mentioned may represent British men and women living thousands of years apart. They clearly belong to the same race, which, for lack of a better we may name the "river-bed race." It is the prevailing type in England to-day, and from the scanty evidence at our disposal we may presume that it has been the dominant form many thousands of years. Remains of the same race have also been found at Schweizersbild in Switzerland. These remains of a Neolithic people have been described recently by Dr. Franz Schwertz. All trace of this race has disappeared in Switzerland, whereas in England, in spite of invasion of Saxon, Jute, Dane, and Norman, it still thrives abundantly. Further research will probably show that this race was at one time widely distributed throughout Europe, where it appears towards the close of the Glacial Period.

REFERENCES.—Sir Richard Owen : *Antiquity of Man as deduced from the discovery of a human skeleton during excavations of the East and West India Docks at Tilbury, London, 1884.*

Samuel Laing and Thomas H. Huxley : *Prehistoric Remains of Caithness.* London, 1866.

CHAPTER III

THE DARTFORD TYPE

WE now return to the lower Thames Valley to follow the history of man still further into the past. The Thames itself is to be our clock—one which has never ceased to mark time and record history on its banks and valley. We have seen how its banks at Tilbury have subsided more than 30 feet since the "river-bed" man was buried there, and how strata of peat, mud, and clay were laid down as the land gradually sank. It is clear, however, that the banks of the river had been sinking many thousands of years before the Tilbury man came on the scene. Beneath him are more than 30 feet of strata—of sand and gravel laid down by the river when the valley was still sinking. There are thus 60 feet of recently deposited strata on the banks of the Thames at Tilbury (Fig. 3, p. 11). If, as a provisional estimate subsidence is regarded as having taken place at the rate of one foot per thousand years, then the 60 feet of deposit at Tilbury represents a period of 60,000 years. During that period we have every reason to believe man lived in the valley

THE DARTFORD TYPE

of the Thaines. Flint implements of a peculiar type are found in the deep "ballast gravels" of the Thames bed, but so far no trace of human remains have been found in the deeper strata.

The strata just mentioned were laid down when the land was subsiding and the river was filling up its bed and valley with new deposits. Before



Fig. 5. Diagrammatic section across the Thames Valley to show the terraces and buried river bed.

this period of subsidence of the land there must have been one of elevation—one in which the river eroded its valley.

At various levels on the sides of the present Thames Valley are found terraces of gravel laid down by the river at various stages of its history. These are roughly grouped into first, second, third, and fourth terraces. The fourth terrace is 10 to 25 feet above the present level of the river,

ANCIENT TYPES OF MAN

and 70 to 90 feet above the deepest bed. The terrace was laid down as a deposit in the river bed when the Thames occupied much the same channel as now, but when the valley was 10 to 25 feet below its present level as regards the sea. No remains of the human body have been discovered in this terrace, but man's handiwork in the shape of flint implements have been found, and they are said to mark the transition from the ancient to the new forms—from Paleoliths to Neoliths. Remains of the bison and the reindeer are also found in this bed. For the purposes of our present enquiry, however, this terrace is barren. Man was there ; his form we do not know for certain, but we have reasons to suspect he was of the "river-bed" type, for the Langwith skull is probably older than this terrace.

In the third terrace, 40 to 60 feet above the present level of the river, no remains of man, other than his stone implements, have been found, with one possible exception—the Dartford skull. The town of Dartford is situated on the banks of the Darent, about two miles above the point where that stream joins the Thames. It is on the south side of the Thames Valley and seven miles above Tilbury. On the western side of the Darent Valley, about a mile above Dartford, there is a bed of gravel, about 18 feet deep, corresponding in level to the third (60-foot) terrace of the Thames Valley. In that bed Mr. W. M. Newton, of Dart-

THE DARTFORD TYPE

ford, opened a pit in the gravel to carry out a systematic search for traces of man. Paleolithic implements were found and also a human cranium. Unfortunately the skull was not seen *in situ*; it

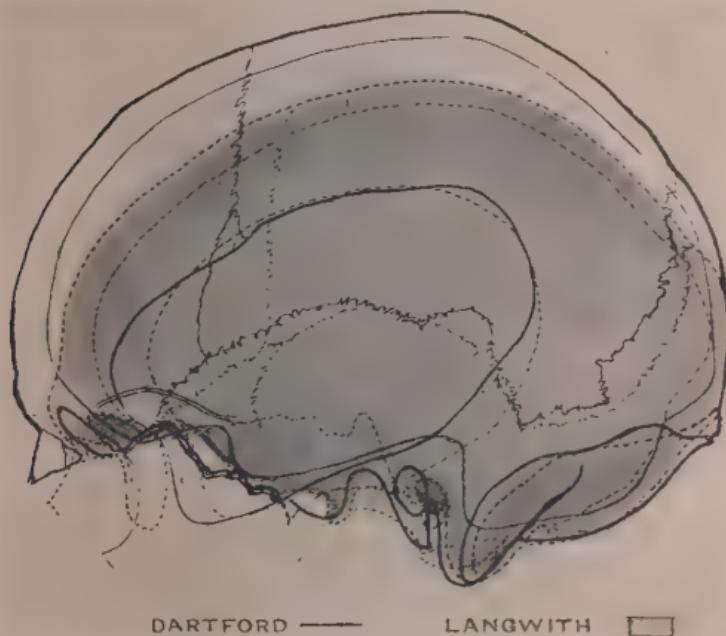


Fig. 6. Profile of the Dartford cranium compared with the "river-bed" type found in Langwith Cave. (One-third natural size.)

was found in a fall which took place from the worked face of the pit. The surface from which the fall took place, both before and afterwards, showed no trace of a disturbance of stratification such as would be caused by a burial. Mr. Newton

ANCIENT TYPES OF MAN

estimated that its position must have been 6 to 8 feet below the surface of the gravel. No other human remains were found.

It must be frankly admitted that the geological evidence in this case is insufficient to assign to the skull the same age as to the gravel deposit. Yet there are certain features in the skull which indicate for it a great antiquity. It resembles those of the Paleolithic race first found at Cro-Magnon in the south-west of France so closely that a relationship to that race cannot be doubted. I will leave the discussion of the nature of this remarkable specimen until I come to deal with the Cro-Magnon race. This, however, may be said now, that in strength, in stature, in physique as well as in size of brain the Cro-Magnon race represents one of the most stalwart human races ever evolved. The discovery of such a race at so early a date as the deposition of the third (60-foot) terrace in the Thames Valley is in direct opposition to all we anticipated. We expected to find evolution working in an orderly manner, passing step by step from a Simian to a modern type of man. The Cro-Magnon was a high type, yet it appears to have lived in the Thames Valley when the 60-foot terrace was formed. The fauna of the valley embraced many animals which are now extinct in England. In the 60-foot terrace occur remains of three species of rhinoceros, two of elephant, with bones of the lion and of the reindeer. So ancient

THE DARTFORD TYPE

is the fauna that the inclination is strong to deny the possibility of so high a type of man as the Dartford existing then. It will be seen, however, that the succession of human races is disorderly, and that the race which survives is not necessarily the one with the big body or with the big brain, nor even that in which there is a combination of such characters.

CHAPTER IV

THE GALLEY HILL MAN. THE OLDEST HUMAN REMAINS YET FOUND IN ENGLAND

LEAVING the fourth and third terraces, one ascends to the still older river bed, the second terrace, in which the earliest known inhabitant of England was found. Galley Hill, the scattered township near which the remains were found, is situated on the south side of the river about midway between Dartford and Gravesend, which is directly opposite to Tilbury. Galley Hill stands out upon a chalk bluff which rises from the flat strip of marsh and meadow-land forming the south bank of the river. Some conception of the great period of time which has elapsed since the second terrace was laid down, and the Galley Hill man embedded and preserved in it, may be formed by trying to realize the condition of the valley when the terrace was deposited. The valley was then level from the 100-foot terrace on the south side to the 100-foot terrace on the north side. The distance from one terrace to the other varies from six to twelve miles. Further,

THE GALLEY HILL MAN

we must imagine the south-eastern part of England submerged until the third or 100-foot terrace has reached the present level of the river banks. Beginning at this point, conceive the land rising at an imperceptibly slow rate, the river wearing down its bed and banks and eroding its wide valley as elevation occurred. That part of the Thames Valley which lies below the 100-foot level has been gradually washed away by the river since the upper terrace was formed. The fact that traces of the river bed are still to be seen on both sides of the valley, so far as ten miles apart, shows how greatly the river must have meandered from side to side and how slow the process of erosion must have been.

As already mentioned, Tilbury and Galley Hill are not far apart. The Galley Hill remains were found in the third terrace on the south side of the river ; the Tilbury remains were found 34 feet below the surface of the Marsh lands of the north bank, four miles further down the river. From the time the Galley Hill man lived until the age of his Tilbury successor the Thames had done more than merely wear its valley down 124 feet—the difference in level between the strata in which these remains were found. It had eroded and deposited an additional 60 feet at least. If we suppose the Thames to have worked on an average at the rate of a foot per thousand years—which is more than we have reason to think it could do we

ANCIENT TYPES OF MAN

must allow a period of about 180,000 years between the dates of those two ancient inhabitants. In brief, we estimate the period of the Galley Hill man to be about 200,000 years distant. The remains of animals found in the gravel of the 100-foot terrace bear out this estimate of antiquity. Bones of the mammoth, of the woolly rhinoceros and of the reindeer are found, animals which we associate with a cold climate. The remains of the straight-tusked elephant (*E. antiquus*), of the hippopotamus, and of the lion also occur, and these we regard as animals of a warmer climate. Most important of all, flint implements shaped by man, of excellent workmanship, are also found plentifully. We know that man was present in the Thames Valley then, and now we must see what kind of man he was.

In the story of the discovery of the Galley Hill man, Mr. Robert Elliott, a printer from necessity, an archæologist by inclination, plays a leading part. On a day towards the end of September, 1888, he and his son Richard set out on a customary visit to the various gravel pits in the neighbourhood of Galley Hill, in the hope of adding to a growing archæological collection. At Galley Hill, as along both banks of the lower Thames, commerce had come to the assistance of the antiquarian. Cement works were eating into the face of the chalk ridge at Galley Hill. The 100-foot terrace—the old river bed—lay over the chalk, and had to be removed before the cement-makers could excavate

THE GALLEY HILL MAN

the chalk. On the day of Mr. Elliott's visit the men working in the gravel pit between the high-road and the face of the chalk ridge which slopes down to the marshes, and immediately to the west of the Schoolhouse, had exposed a human skeleton. The skull was already removed ; the schoolmaster, Mr. Matthew Hayes, had seen it in the morning when it lay in place in the face of the sand-bank, some eight feet from the surface and two feet above the underlying chalk. Mr. Elliott examined the place ; the stratification of the overlying sand and gravel was undisturbed ; the various layers were just as they had been laid down ; a burial would have disturbed them. Besides, the depth was too great for a recent burial. On setting to work Mr. Elliott was able to recover other bones of the skeleton from the same loamy layer—one evidently laid down in a pool of the old river bottom. The remains found are sufficient to provide a fairly complete picture of one of the race which presumably fashioned the flint implements found in the 100-foot terrace. So soft and fragile were the bones when found that they had to be set in the sun to dry, and unfortunately in the drying the skull warped. The bones were found in 1888, but it was not till 1896 that a full and excellent description of them was published by Mr. E. T. Newton, F.R.S. Later this relic of ancient man passed into the collection of Mr. Frank Corner. To that gentleman my thanks are due for placing

ANCIENT TYPES OF MAN

the skeleton freely at my disposal, and for the opportunity of making a more minute investigation than had been made previously. The first impression on examining the remains of this earliest known inhabitant of England is one of surprise, almost of disappointment ; in all his features, with a few exceptions, he is so modern in build that we might meet him on the streets of London to-day and pass him by unnoticed. He was a man of rather low stature, about 5 ft. 3 or 4 in. (1600 mm.), as may be judged from his thigh bones, which are just over 420 mm. long, the right rather longer than the left. The thigh bones are somewhat peculiar in shape ; as in the Tilbury man and Neolithic races generally, the upper part of the shaft is flattened from back to front and the neck of the bone is long. Another peculiar feature is the wide separation of the two condyles at the lower end of the femur. No doubt these features indicate a peculiarity in the posture and gait, but in spite of much research we have not yet discovered what these peculiarities are. All we are certain of is that we occasionally see amongst modern people the same type of thigh bone, and that such men walk in the upright posture just as easily as those with rounded thigh bones. Nor were the proportions of his limbs peculiar. In a modern man of 5 ft. 4 in. we expect the thigh bone to be about 425 mm. ; in the Galley Hill man it is a little over 420 ; the tibia or leg

THE GALLEY HILL MAN

bone in a modern man of this stature is 250 mm. ; in the Galley Hill man the tibia is broken, but its original length may be estimated at 325 mm.—an inch shorter than we usually see in modern men of this stature. The humerus is also broken, but its length, judging from the upper two-thirds which are preserved, was about 310 mm.—about half an inch longer than is usual nowadays in men of his stature. Thus, as amongst the Lapps, the leg bones were short and the arms rather long, but these may be only features of the individual and not of the race. We see thus that at an early stage of the erosion of the Thames Valley man's posture, gait, and proportions were already completely evolved. The modifications since then concern only bodily details.

Another remarkable feature of this inhabitant of Ancient Britain deserves mention. The greater part of the right collar-bone (clavicle) is preserved. The bone evidently was rather a short one (130 mm.), but on it is an impression which shows that the chief driving muscle of the arm—the pectoralis major—was mightily developed. The impression for its insertion to the upper end of the humerus is also pronounced. The great pectoral muscle, which crosses outwards in front of the armpit, was evidently trained to its full capacity. Such acts as thrusting a spear from the shoulder, or hurling a javelin, would entail a great pectoral development. The short clavicles indicate that

ANCIENT TYPES OF MAN

he was rather a narrow-shouldered man, and fragments of three ribs show us that his chest was rounded and strong, for the ribs are stouter than those of modern men of his stature.

It is in the head that we must seek for characters to fix the position of the Galley Hill man in the racial scale of humanity. With the assistance of Mr. F. O. Barlow, I was able to obtain a cast of the cranial cavity which shows very clearly the superficial features of the brain. The arrangement and form of the convolutions and fissures show the same features as the brain of modern man. The parts we connect with speech, with sight, with motion are all there. In shape it is peculiar ; it is very long and narrow. These are not Simian characters, nor have we any reason to believe that a short and wide brain is better than a long and narrow one. The thousands of flint implements found embedded in the same stratum of the 100-foot terrace show that the race to which the Galley Hill man belonged could use their brains and hands to carry out an art which requires a high degree of skill and design. The imperfect condition of the skull precludes an exact estimate of the size of the brain ; it was over 1350 cubic centimetres and under 1400 cc. In an average modern man of his stature we should expect a brain of 1450 to 1475 cc. ; but there are many men in England to-day with smaller brains than the Galley Hill man. In Jonathan

THE GALLEY HILL MAN

Wilde, who was a couple of inches taller, the brain cavity measured 1425 cc.

The feature of the Galley Hill man is the length of his skull ; it is 8 inches (203 mm.). To the reader this may mean little, but when it is remembered that the " river-bed " men, who appear when the Thames Valley had reached its present depth, had a maximum head length of $7\frac{1}{2}$ inches (184 mm.) it will be seen that it means a great deal, especially if we regard the specimen found at Galley Hill as representative of his race. We find a very ancient race on the Continent with a similar form of head, and that is one of the chief reasons we have for supposing we are dealing with a representative individual in the Galley Hill man. Individuals with a head equally as long as the Galley Hill man still occur in England. In a hundred mediæval crania from Northamptonshire Mr. Parsons found one with a length of 205 mm. and two of 200 mm., although the mean length for the hundred is that of the river-bed people—184 mm. The length of the skull in the Galley Hill man is not due to massing of bone in ridges over the orbits ; indeed, the supra-orbital ridges are only slightly more marked than in modern men. Just over the orbits the thickness of the skull is 14 mm.—a little above the modern average. The skull, however, is thick ; the frontal bone in place of being 6 to 8 mm. is 12 mm. thick, a feature which occurs in very ancient skulls.

ANCIENT TYPES OF MAN

In old people, too, the cranial wall is apt to thicken, but from the wear of the teeth and from the degree to which the bones of the skull have united at

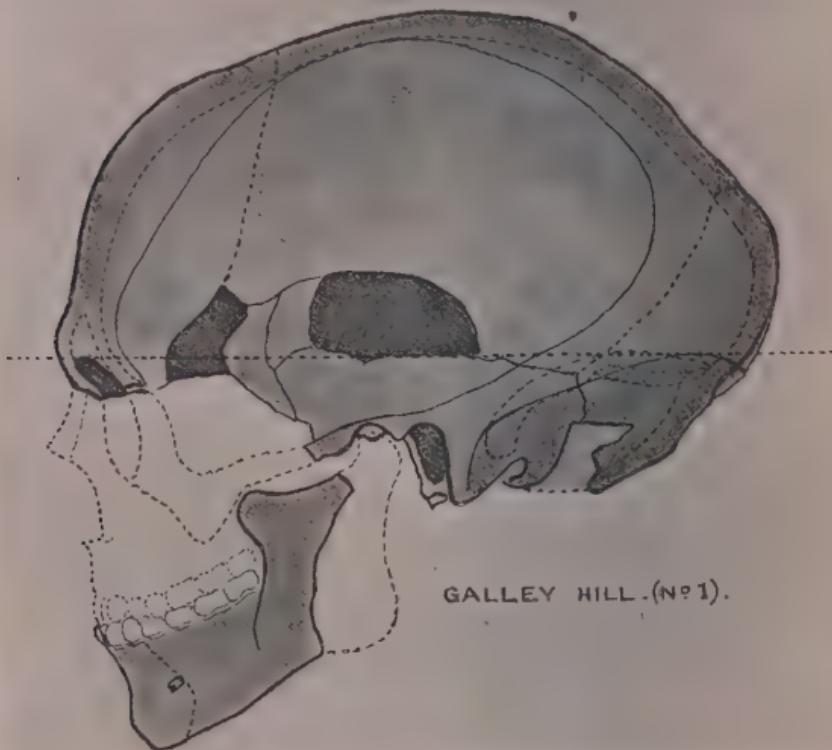


Fig. 7. Profile of the skull of the Galley Hill Man.

their sutures the thickness in the Galley Hill man is apparently not due to age ; he was past middle age—probably about fifty.

There are certain circumstances which make an

THE GALLEY HILL MAN

accurate measurement of the width of the Galley Hill skull difficult. One side is partly broken away, and in drying the skull warped. By the use of special methods and instruments the difficulties can be overcome, and there is no doubt its width was at first underestimated ; in place of being 130 mm. it is 138 to 140 mm.—nearly the same width as the river-bed crania and 2 or 3 mm. less than is the modern average. The breadth is about 69 per cent of the length ; in the river-bed crania, the average is the same as in modern English crania, 74 to 76 per cent. In the phraseology of the craniologist, the Galley Hill man was markedly dolichocephalic. As is common in this type of skull the forehead was narrow, but of good height and not receding. The height of the vertex of the skull above the ear passages is 120 mm. In height of skull the Galley Hill man was not peculiar ; Mr. Parsons gives 120 mm. as the corresponding measurement of the Northamptonshire crania. Thus we see that in England there still persists here and there a man who shows cranial features very similar to those found amongst the inhabitants of the Thames Valley so long ago.

As is usually the case in such finds, the chief part of the face had perished. Fortunately the left half of the lower jaw, carrying five teeth, two premolars, and three molars, was found. By placing the jaw in its proper relationship to the skull it is possible to reconstruct, with a consider-

ANCIENT TYPES OF MAN

able degree of accuracy, the main outlines of the face. The face was short and relatively wide. In an average modern Englishman the face,

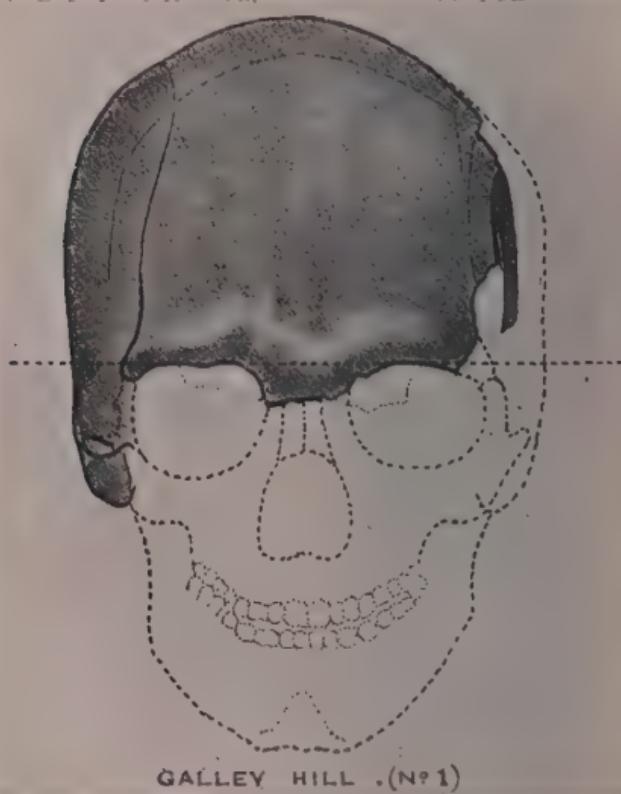


Fig. 8. Galley Hill skull—full face. (One-third natural size.)

measured from the root of the nose to the lower border of the chin, is about 120 mm. ; in the Galley Hill man it was about 100 mm., the deficiency being due to the shortness of the upper

THE GALLEY HILL MAN

face. The nose was short, but from the conformation of its root we infer that it was prominent and perhaps rather wide. The extreme width of the face was 130 mm., 5 mm. in excess of the average modern man. The chin, if not so pronounced as in modern mandibles, was certainly present. One sees on the mandible the same muscular impression as in modern man—impression caused by the muscles which move the tongue and lips. We may infer, therefore, that the tongue was used in speech in much the same way as we use it now. There is nothing anthropoid in the lower jaw, and yet it shows some primitive features. The coronoid process to which the temporal muscle—the chief muscle of mastication—is attached is separated from the articular process of the jaw by a deep notch in all modern specimens. Here there is no notch; it is filled up with bone to give strength. The need for a strong coronoid process is apparent when the extensive impressions for the temporal muscles are noted on the sides of the skull. The ridges which bound the origins of these muscles reach to within 40 mm. of the median line on the vertex of the skull, whereas in modern crania they fall short of it by 60 mm. In anthropoids these ridges may reach the vertex. We see then that the muscles of mastication were uncommonly well developed in ancient man, but the teeth themselves, and the palate, the size of which can be

ANCIENT TYPES OF MAN

estimated from the lower jaw, are not markedly different from the same parts in modern man. In no sense can the lower molar teeth, and they indicate the condition of the upper, be said to be primitive either in size or shape. In apes with a dentition at its highest point of development, such as the baboon and gorilla, the last lower molar is larger than the first ; when retrogression sets in, the last is the first to diminish. In a large-toothed race, like the extinct Tasmanians, the last lower molar is equal in size to the first ; the middle tooth being slightly smaller. In this race the front to back measurement of the crown of the first lower molar may amount to 13 mm. ($\frac{1}{2}$ in.), in the Galley Hill man the crown of the first molar is only 11 mm., a common dimension in modern man, while the last molar is only 10.2, about the same size as the middle or second molar. Thus in the Galley Hill man retrogression of teeth has already commenced ; the last lower molar is reduced to the size of the second. In the majority of modern Englishmen it is smaller than the second, dental retrogression being still more marked. The middle and last molars have only four cusps in the Galley Hill man, whereas many of the more primitive human races still show five—apparently the original number. The premolar teeth agree absolutely in size and shape with their modern representatives, the first being 7 mm. and the second 7.5 mm. in the front to back diameters of

THE GALLEY HILL MAN

their crowns. The teeth show no trace of disease, and are worn in the same manner as in the Neolithic Essex woman, but not to such a degree, although he appears to be older than she was. The size of the palate was apparently very little different from the modern average, the modern being longer and narrower. For instance, the length of the lower bite, measured from a point between the middle incisors to the mid-point of a line drawn transversely behind the crowns of the last molars, is 46 mm. in modern Englishmen, and 44 mm. in the Galley Hill man. The breadth between the outer borders of the last molars is 77 mm. in the Galley Hill man, and only 68 mm. in modern Englishmen. There thus appears to have been little alteration in the development of the palate and teeth during the exceedingly long interval which elapsed between the dates of the Galley Hill and the later Neolithic man. In that long period the nature of the diet remained the same. The reduction of the teeth and palate evidently commenced when the more prosperous conditions of modern civilization were introduced.

Quite recently a second example of a human skull from the upper terrace (90 to 100 feet) at Galley Hill was sent to me for examination. I have mentioned the fact that Mr. Matthew Hayes, the schoolmaster of Galley Hill, was the first to see the Galley Hill skull when exposed by the

ANCIENT TYPES OF MAN

wishes. He was naturally disappointed when he found Mr. Elliot had come on the measure and obtained possession of an object he wished to add to his own collection, and hence took no further interest in the find nor did he then mention the skull I am now to describe as the second Galley Hill skull.

In 1894, four years prior to the discovery of the famous specimen, the bank of gravel on the chalk cliff extended to the north of the school. Some thin beds from where the celebrated discovery was afterwards made. Mr. W. H. Scammon, now headmaster of the day school, now known as Northfleet, was then assistant master at Galley Hill. The subsoil, passing on the north face of the cliff had recovered the fragments of a human skull with several other bones and brought them to Mr. Scammon who placed them in his School Museum where they are now. To the best of his recollection these were above a foot below the surface level of the terrace. It was only later, on seeing reports concerning the remains just described that he realized the find made so long ago as 1894 would still be important. The skull is sufficiently perfect to prove that it is of the same form as the type specimen. Its length is just under six inches. Its width is one and one half as to the greatest height. The nose is one third the length of the face, the latter being four in length as to the original

THE GALLEY HILL MAN

specimen. Its height is rather less—116 mm.; the forehead is 100 mm. in width—about the same as in the original; its capacity is rather greater, and the brow ridges and impressions for the muscles of mastication less pronounced. The bones too are thinner, the frontal being 6 to 8 mm. in place of 11 to 12. They do not show the same degree of erosion and weathering. The cranium is whiter and more permeated with calcareous salts. The limb bones however, are of a totally different type, and indicate a tall man with the shafts of the thigh bones not flattened as in the original, but cylindrical as in modern man.

The evidence on the whole is decidedly against the probability of the second Galley Hill remains being of the age of the river-foam terrace. Before passing a final opinion as to their antiquity it will be well to wait and see what future discoveries may tell us.

The reader may naturally ask: To what race does the Galley Hill man belong? The answer is that he is a type of a new race which at the same time is very old. He represents a race to which we may rightly give the name of "Galley Hill." The race is still represented in the modern population of Britain by a scattered remnant. The race is both ancient and modern; ancient in the sense that it was evolved long before the valley system of England had taken on its present configuration, modern in the sense that in all his parts, in spite

ANCIENT TYPES OF MAN

of his long and narrow head, his short and wide, rather negroid face, he stands as the most ancient representative of the Europeans in their modern form.

We also know something of the climate of England during the formation of the upper terrace, in which the remains of the Galley Hill race are embedded. In it are found the bones of animals which indicate a warm climate, such as the lion and the straight-tusked elephant and the hippopotamus; in it too are found remains of the woolly rhinoceros and the mammoth, usually regarded as denizens of cold regions. We presume that the Arctic fauna succeeded the temperate, for in the lower and later terraces of the Thames Valley the mammoth, the woolly rhinoceros, joined subsequently by the reindeer, still occur, when the lion and hippopotamus were extinct in England. The Galley Hill race evidently lived during a period in which the climate of the South of England was changing from a temperate to a cold one and when the land was undergoing elevation with consequent deepening of the Thames Valley. Previous to the temperate period there must have been one of extreme cold, for the third or 100-foot terrace lies on boulder clay and other formations which can only be deposited in a country deeply covered with ice. The Galley Hill race flourished then in a temperate period which was preceded by an extremely cold one.

THE GALLEY HILL MAN

and followed by one in which the cold was less severe. Apparently he belonged to the last of the temperate intervals which lie within the Glacial Age.

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CHAPTER V

THE MEN OF BRÜNN AND COMBE- CAPELLE

IT is not likely that the Galley Hill race arose in England. It was probably originally a Continental race, for our early history is a long story of continual immigrations and invasions. Western waves of the Continental sea of humanity seem to have surged into Britain since Europe was first inhabited, and that is many hundred thousand years ago. We modern British have arisen by a process of mixture and happy hybridization. Our ancestors of the river-bed type dominated England for many thousand years, but, as we shall see, they too appear to have arisen on the Continent, and were at first aliens in Britain. The Galley Hill type and perhaps also the Cro-Magnon, preceded them in England. Both of these types are Continental in origin. When we in turn become an invading race we turn our faces westwards as did our Paleolithic ancestors.

We propose now to cross to the Continent and search for traces of the Galley Hill race. This type has been found at Brünn, the chief town of the

THE BRÜNN MAN

Austrian Province of Moravia, some sixty miles north of Vienna. The wide valley in which Brünn is situated is covered by a thick stratum of loess—a chalky clay. A tributary of the Danube—the Ponafa—flows slowly down the valley and has had much to do with the deposition of the deep strata on which Brünn is built.

The period at which the stratum of loess was laid down can be dated with some accuracy. Remains of the mammoth and of the woolly rhinoceros occur in it abundantly, from which it may be safely inferred that its formation belongs to the latter part of the cold or Glacial Period. In 1891, when a canal was being cut through the city, a number of mammoth and rhinoceros bones, with a human skull, were found in the undisturbed loess, $4\frac{1}{2}$ metres (11 $\frac{1}{2}$ feet) from the surface. The formation is probably not so old as the 100-foot terrace in which the Galley Hill remains were found ; it corresponds rather to a date between the 50- and 20-feet terraces—a period perhaps 50,000 years later than the Galley Hill man, if the rough method of estimation used here can be trusted to guide us. The civilization is very different from that of the Galley Hill man ; all we know of him are his fine flint implements ; but we know the art of the man of Brünn. With the skull was found the image of a bearded man carved from the ivory of a mammoth's tusk. We know that he ornamented his body ; six hundred perforated small shells (Den-

ANCIENT TYPES OF MAN

talia), part of his elaborate necklace, were found near the skull. The implements of bone found with him are highly finished scrapers. We have no evidence

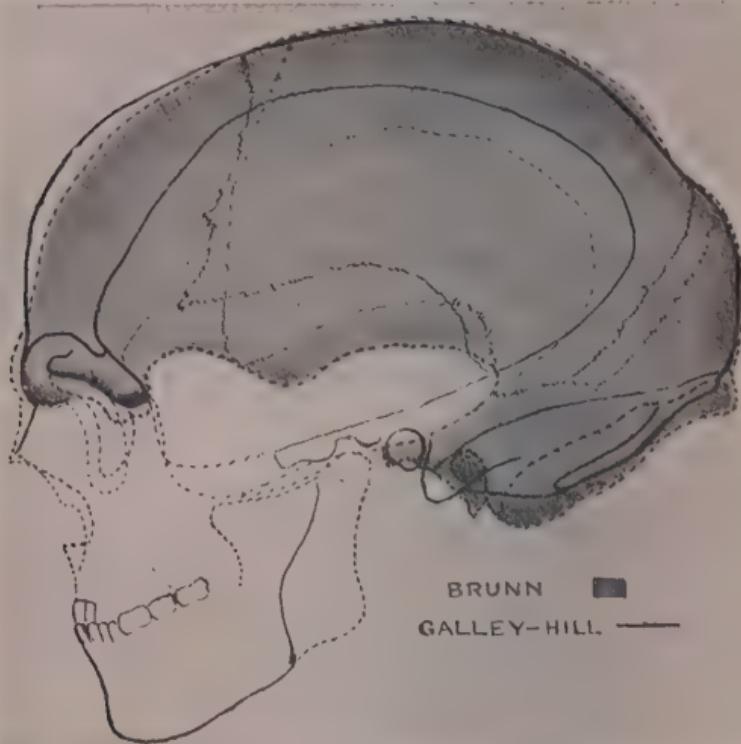


Fig. 9. The profile of the Brünn and Galley Hill skulls.
(One-third natural size.)

to show that the Galley Hill man had reached such an advanced point on the road to a higher civilization. We owe much to Professor Makowsky of Brünn for the records of this discovery, but the

THE BRÜNN MAN

merit of recognizing the affinities of the Man of Brünn to the Galley Hill race at a later date is due to Professor Klaatsch of Breslau.

Not only is there a remarkable resemblance in size and shape between these two ancient skulls found so far apart, but the actual parts which have escaped natural decay are almost identical. In both, the facial parts have perished, but the roof of the skull and half of the lower jaw, with some teeth, have been preserved in each case. The Brünn skull, like the Galley Hill one, is remarkably long and narrow. In the latter it was 203 mm., in the former 206 mm. ($\frac{1}{8}$ in. longer). In both one side is deficient, but in the Brünn specimen the degree of *post mortem* distortion is less. The Brünn skull is wider than usually thought; Makowsky estimated its width at 139 mm. (the same as the Galley Hill), but a minute examination of the cast has convinced the writer that it was at least 144 mm., the breadth or cephalic index being thus 69 per cent—a figure corresponding to that of the Galley Hill. The capacity was probably greater than that of the Galley Hill, being about 1400 cubic centimetres (Makowsky gives 1350), and thus about 80 cc. below the average of modern Europeans. He was a more brawny individual than his English counterpart, for the muscular processes, especially those for the muscles of his neck, are more pronounced. He was a bull-necked fellow. He was

ANCIENT TYPES OF MAN

also an older man—at least his teeth, especially the first and second molar teeth, are much more worn. Some of the crowns are ground almost to the roots. The wear of teeth depends as much on the nature of food as on age, and hence is not a reliable guide. Nor does the degree to which the skull bones have united give a sure clue to age, for evidently in the Galley Hill race these became ossified together at an early period of manhood. If Makowsky's observation is accurate the last lower molar was remarkable. It was much larger than either the first or second molars, whereas in modern European races it is smaller. From the drawings given by the discoverer we may infer that the size of the palate was similar to that of the Galley Hill man, but apparently the prominence of the chin was more pronounced. The branch of the mandible which ascends to articulate with the skull and receive the muscles of mastication was longer, and in shape more like the same part in modern man. The face of the man of Brünn was therefore rather longer and more modern than that of the Galley Hill man. In neither was there such a prognathism as we see in modern negro races, for the good reason that they had less massive teeth.

The parallelism between the discoveries at Galley Hill and Brünn may be continued further. It will be remembered that at Galley Hill another specimen was produced which had been found some years before the more important discovery.

THE COMBE-CAPELLE MAN

A second Brünn skull was found in 1885, in the same stratum, but at some distance from the one now known as the first. Like the second Galley Hill skull its history is imperfect, but its authenticity is more probable. Its length is estimated at 192 to 195 mm. ; its breadth at 139, its index being thus 72. It represents in the writer's opinion the female type of the race. Its dimensions and its muscular prominences are such as we expect to find in the woman of the Brünn type.

In 1909 a discovery was made in the south-west of France which shows the wide distribution of the Galley Hill type in ancient times. In the caves and rock shelters of the limestone terraces which flank the valley of the Dordogne, French anthropologists have deciphered the history of Paleolithic man. In their hands cave-research has become a science. In the present instance, however, the discovery of an ancient man of the Galley Hill type in this region was made by a skilled Swiss archaeologist, Herr O. Hauser. In the beginning of 1909 he set his men to work in a narrow terrace under a limestone cliff, just such a spot as Paleolithic man would choose for a shelter. The site is known as Combe-Capelle, and is situated on the south side of the Dordogne, a little way below the place where this river is joined by the Vézère. By August of that year his foresight was rewarded by the discovery of the complete skeleton of a man at a depth of a little over 7 feet (2.55 metres). To reach

ANCIENT TYPES OF MAN

this depth the remains of three separate epochs of civilization were passed through. When the upper layer of black soil was cleared away a thick stratum was exposed which had been formed when generations of men had lived in the shelter of the

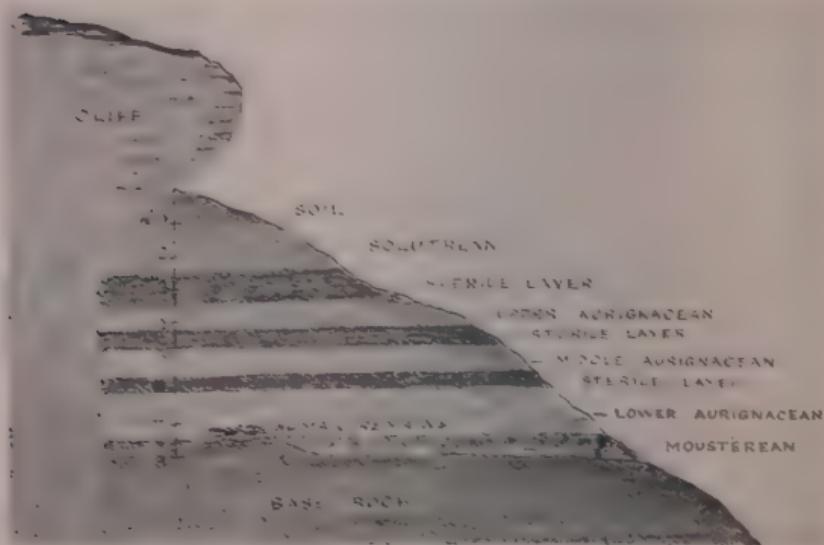


Fig. 10. Section of the strata in which the ancient human remains were found at Combe-Capelle.

overhanging cliff and left remains of their hearths, of their stone and bone implements and the débris of their feasts. The drip from the limestone rock saturated, solidified, and preserved these evidences of a remote civilization ; here is no preservative for bones equal to a continual drip laden with

THE COMBE-CAPELLE MAN

limestone in solution. It permeates the pores of the bones and mineralizes them. The civilization of the upper layer of the Combe-Capelle shelter is of the type assigned to the Salutréen Period—one which falls in the later third of the Paleolithic Period. Beneath the Salutréen lay a sterile layer, deposited when the shelter was unfrequented by man. Below this layer came another stratum containing traces of man which Herr Hauser assigns to the later or younger Aurignacien Period ; then another sterile layer followed by one belonging to the middle Aurignacien, and finally the sterile layer which overlay the stratum in which the human skeleton was found. The last sterile layer apparently formed the floor of the shelter when the man now to be described was buried in it—buried in the material which had accumulated when he and his forefathers dwelt there. He did not fall by chance to be buried by the slow accumulation of debris detached from the cliff, for he lay on his right side, in the crouching posture, with his feet to the south, head to the north, and numerous flint implements placed round him and in a grave which clearly had been prepared for him. Over him lay the unbroken strata formed by the civilizations of succeeding periods. Some remains of the pig and of the urus—a primitive form of ox—were found in the same stratum, but nothing of the mammoth or woolly rhinoceros or of animals which help us to fix a

ANCIENT TYPES OF MAN

geological date for him. Nor have we, as in the Thames Valley, the work of the river to give us a rough indication of time. We have only the flint implements he used, and they assign him to the beginning of the period named the Aurignacien. In England we suppose this period to correspond to the formation of the lowest (20-foot) terrace of the Thames Valley, and therefore long after the period of the Galley Hill man and possibly also subsequent to the date of the man of Brünn.

Professor Klaatsch, who examined and described the remains, unhesitatingly assigned the Combe-Capelle man to the Galley Hill race. The maximum length of the skull is 198 mm., 5 or 6 mm. less than the Galley Hill; the maximum width is 130 mm., about 10 mm. less, but we see here a head of the same narrow long type. Indeed, the relative width is less, being only about 66 per cent of the length. We must not suppose that any two individuals showing long and narrow heads are of the same race; we find narrow-headed forms amongst both black and white races which we cannot suppose to be nearly related. The height of the vault above the ear-holes is considerably more in the Combe-Capelle than in the Galley Hill skull—at least 5 mm., and the highest point of the crown of the head is further back—nearer the occiput. We know the face of the Galley Hill man only from the mandible, but there is sufficient to show that the face form

THE COMBE-CAPELLE MAN

differed from that seen in the Combe-Capelle man. The teeth of the latter are more massive, the

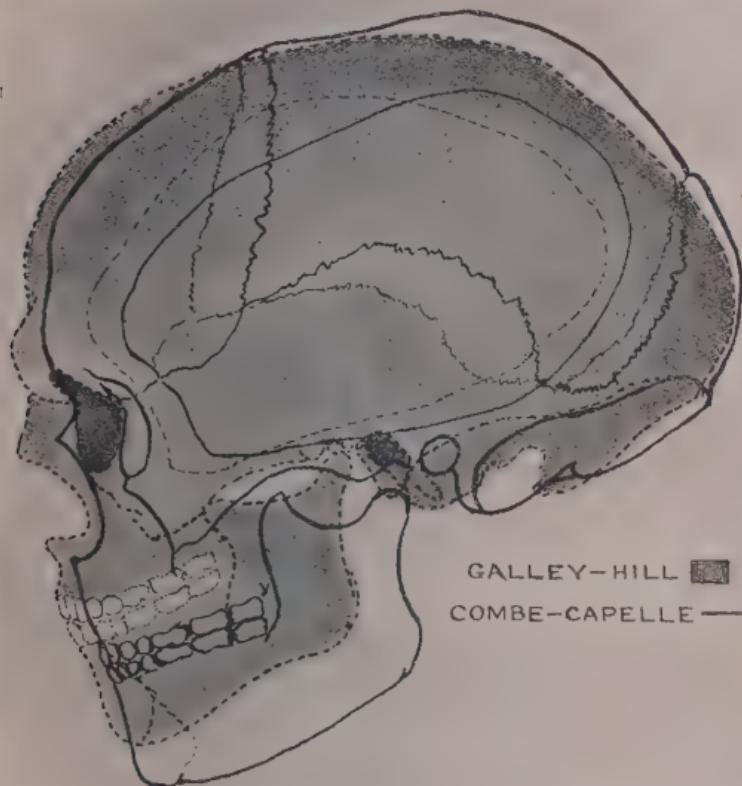


Fig. 11. Profile of the skull of the Combe-Capelle Man compared with the profile of the Galley Hill man. (One-third natural size.)

palate is longer and narrower, characters which, with the increased height of the skull, betoken a tendency towards features usually associated with

ANCIENT TYPES OF MAN

a negroid race. On the other hand, the characters of the forehead are the same in both ; the width of the face was also about the same (130 mm.) ; but while the face in the Combe-Capelle man was of medium length (116 mm.), that of the Galley Hill man was decidedly short (104 mm.), and shortness of face is frequently a character of negroes. Both men were of short stature, about 1600 mm. (5 ft. 3 in.), but while the thigh bone of the Combe-Capelle man is only 3 mm. longer than that of the Galley Hill, yet his leg bone (tibia) is at least 40 mm. more. Now a relatively long leg bone is a feature which is usually seen in negroids, and in this feature the Combe-Capelle man is decidedly of that race. Thus while the writer is inclined to agree in provisionally assigning the Combe-Capelle man to the Galley Hill race he believes that further discoveries will show that the Combe-Capelle man belongs to a branch marked with certain negroid features.

Before quitting the Galley Hill type there are two very ancient skulls which deserve mention because they serve to bridge the gap between the Tilbury or river-bed and the Galley Hill types. So long ago as 1833 Professor Schmerling, a Belgian archæologist, on excavating the floor of a limestone cave—the Engis Cave—in the valley of the Meuse, found at a depth of 5 feet ($1\frac{1}{2}$ metres), the roof-part of a human skull. With it were found remains of the mammoth and woolly

THE COMBE-CAPELLE MAN

rhinoceros, so we may infer that we are dealing with a skull nearly if not quite as old as that at Brünn or Combe-Capelle. The skull is shorter, wider, and higher than the Galley Hill type ; indeed, in all those points it approaches the Tilbury form. In the opinion of its discoverer, a very cautious and judicious scientist, this skull showed certain characters which approximate it " to the cranium of an Ethiopian rather than to that of a European." It was of this specimen that Huxley said, " It is, in fact, a fair average human skull, which might have belonged to a philosopher or might have contained the thoughtless brains of a savage." Thus at a very early date there was evolved a type of skull intermediate to the Galley Hill and river-bed types, and one in which Professor Schmerling thought he traced some features of the Negro.

Another skull of the same intermediate type was discovered in Bohemia—the most western Province of Austria—near the town of Brüx. It was discovered in 1871, but a knowledge of its exact nature we owe entirely to the recent investigation of Professor Schwalbe of Strassburg. It belongs to a later date than the Engis specimen, to a period preceding that of the Tilbury skull, with which it has much in common.

The present evidence points to a wide distribution of a race of the Galley Hill type throughout Europe in the latter part of the Glacial Period and the earlier part of the Post-glacial. Its

ANCIENT TYPES OF MAN

origin we do not know. The type is still to be met with amongst modern British people. It is probable that the river-bed type was evolved from the Galley Hill type. Certain features of this type point to a relationship with negroid races.

REFERENCES.—Prof. Alex. Makowsky: "Der diluviale Mensch in Loess von Brünn." *Mitth. Anthrop. Gesellschaft in Wien*, 1892, Bd. XXII, p. 73.

Prof. H. Klaatsch and O. Hauser: "Homo Aurignacensis Hauseri." *Præhistor. Zeitschrift*, 1910, Bd. I, p. 273.

Prof. G. Schwalbe: "Das Schaadel-fragment von Brüx und verwandte. Schaadel-formen." *Zeitsch. für Morphologie und Anthropologie*, 1906, p. 81.

Prof. Schmerling. See Huxley's *Man's Place in Nature*. London, 1863.

CHAPTER VI

THE GRIMALDI OR NEGROID TYPE IN EUROPE

IN the cliffs which flank the beach near Mentone there are a number of caves which for a long period of time afforded a habitation for ancient man. At the close of the last and at the beginning of the present century, largely owing to the interest taken in the history of primitive man by the Prince of Monaco, systematic excavations were carried out in deep strata of their floors. In one of these, the "Grotte des Enfants," usually named the Grimaldi Cave, the various strata of the floor made up a thickness of $8\frac{1}{2}$ metres (28 feet). In the lowest layer of all were found two skeletons—one of a woman past middle life, with a stature estimated at 1570 mm. (5 ft. 2 in.), and the other of a boy about sixteen to seventeen years of age, and about 1550 mm. (5 ft. 1 in.) in height. With them were found traces of a civilization and of a fauna which has led anthropologists to assign them to the end of the Mousterien or beginning of the Aurignacien Period—about the same or perhaps before the period assigned to the

ANCIENT TYPES OF MAN

Combe-Capelle man. They have the narrow and long heads of the Galley Hill race. In the woman the maximum length of the head is 191 mm.; in the boy, probably her son, it is 192; the width of the skull in the mother is 131 and in the son 133. The proportion of breadth to length is about 68 per cent—the same as in the Galley Hill race. Yet Dr. Verneau, who has published the results of a minute examination of these two ancient individuals, from various features seen in the skeletons, had no hesitation in assigning them to a negroid race.

It is an easy matter to distinguish the skeleton of the true negro from that of the pure white, but there are many intermediate races—not hybrids—which show a puzzling mixture of characters. The ancient Grimaldi woman and boy are of the mixed or negroid type. We associate large white teeth, full prominent jaws, and receding chin with the races showing pigmented skins. In the old woman, a great number of the teeth have been lost during life and the dental characters are uncertain. The shallow, projecting incisor part of the upper jaw and the characters of the chin are certainly features of a negroid race. So are the wide opening of the nose, the prominent cheek bones, the flat and short face. Yet the bridge of the nose is not flat as in negroes, but rather prominent as in Europeans, and the capacity of the skull (1375 cc.) is of ample dimensions for a woman of her size.

THE GRIMALDI TYPE IN EUROPE

As to the boy, his teeth are large and of the negro type ; he bears a striking resemblance to the woman, and his cranial capacity (1580 cc.) indicates a brain distinctly above the modern in size. The leg bones of mother and son are relatively long as in negroes. In that race the two eminences or bosses of the forehead usually meet and join together in a high median prominence, whereas in white races they remain separated, and this is the case in the Grimaldi skulls. Indeed, in the features of the forehead the Grimaldi remains agree with the Galley Hill type. It is a remarkable fact that the natives of the uplands of the Sandwich Islands—a true negroid race—reproduce to-day the cranial features of the ancient inhabitants of the Grimaldi caves.

To appreciate the true significance of a negroid race in the south of Europe towards the close of the Glacial Period, we must look at the distribution of modern races. A line from Gibraltar in the West to the Phillipine Islands in the Far East passes through a zone where the fairer skins of the North pass into the darker skins of the South. To some extent it may be a zone in which intermixtures of fairer and darker races occur, but in the main it is better to regard it as a zone in which human races have inherited from the ancestral stock of modern humanity some of the characters which now distinguish the European, and some that distinguish the Negro ; but both Negro and

ANCIENT TYPES OF MAN

European are highly specialized examples of the modern type of man. The discovery of the Grimaldi race does not indicate that we have reached the common stock from which black and white races have evolved; that point must lie much farther in the past. It merely indicates that towards the end of the Glacial Period the negroid race which we see in the north of Africa to-day was already evolved, and that it extended into Europe. The land connections between Europe and Africa we know to have been much closer in the time of the Grimaldi people than they are to-day. There are other evidences of a negroid race in Europe. The negroid traits of the Combe-Capelle man have been mentioned; but there is also the remarkable fact that statuettes and engravings which are assigned to this period represent certain bodily characters of the negro. The Grimaldi people are the earliest negroid type so far discovered, yet they are so modern and highly evolved in character that we cannot suppose them to represent a common ancestor of European and African races. If, however, we suppose that all races of modern man have been evolved from a common stock, we naturally expect, especially in the earlier stages of the evolution of modern races, to find intermediate types between the extreme racial forms now found in North Europe and Central Africa. The Grimaldi people seem to

THE GRIMALDI TYPE IN EUROPE

represent an intermediate type in the evolution of the typical white and black races.

REFERENCE.—Dr. René Verneau: *Les Grottes de Grimaldi*, Vol. II. Monaco, 1906.

CHAPTER VII

AN ANCIENT RACE OF TALL MEN: THE CRO-MAGNON

THESE is a widely spread notion that our remote ancestors were a race of giants. Hitherto, as we have passed from type to type into a remote past that takes us well within the Glacial Period, the samples of ancient humanity preserved to us have been one and all people of a low stature- only 5 feet or a little over. Now we proceed to consider the oldest race of great stature that has yet been discovered, one which flourished in the south of France when the last of the cold periods was lifting from Europe. The first examples of this race were discovered in 1868, when a railway was being constructed in the valley of the Vézère, a tributary of the Dordogne. A cutting made in the débris at the foot of the limestone cliffs which flank the valley of the Vézère at Cro-Magnon, brought to light the skeletons of a man, of a woman, and part of the skull of a third individual. Hence this ancient type or race is usually named Cro-Magnon. We now know ten individuals of that race of which eight are men

AN ANCIENT RACE OF TALL MEN

and two are women. The stature of five of the men can be estimated with some degree of exactness—it varies from 1820 to 1870 mm. (5 ft. 11 $\frac{1}{2}$ in. to 6 ft. 1 $\frac{1}{2}$ in.). The woman, as is usually the case in tall races, was evidently of a smaller stature ;



Fig. 12. The site of the discovery of the Cro-Magnon Race. The foreground represents a section. A—Limestone Cliff. B—Ledge overhanging the Ancient Shelter. C—Débris fallen from the cliff in which the remains were found. D—Alluvium. (After Quatrefages.)

we can estimate the height of one only ; she was young and measured 1560 mm. (5 ft. 3 $\frac{1}{2}$ in.).

The discovery of the human remains at Cro-Magnon in 1868 was made at the time when scientists were beginning to realize that the history of ancient man could be deciphered in the caves and old rock shelters along the valleys

ANCIENT TYPES OF MAN

of the Dordogne and Vézère, and when a band of young men was arising in France who knew how to interpret the human signs found there. We owe our knowledge of the Cro-Magnon race to the French School of Anthropologists. Ed. Lartet, a member of the older school, recognized the antiquity of the race and defined its characteristics as found in the south-west of France; members of the modern school, Verneau, Boule, Rivière, and Cartailhac, have extended that knowledge by their researches in the cliff caves of Monaco, in the south-east of France. The Cro-Magnon race was discovered at a period when, under Darwin's influence, anthropologists expected to find man becoming more primitive in mind and body as his history was traced into the past. The discovery at Cro-Magnon showed that the evolution of human types was not an orderly one, for, in size of brain, and in stature, the race which flourished in the south of Europe at the close of the Glacial Period was one of the finest the world has ever seen. Yet they must have been grim-visaged and savage-looking men.

When ascending the sides of the valley of the Thames, from the more recent deposits where the Tilbury man was found to the upper and older terrace where the Galley Hill man was unearthed, mention was made of the discovery in an intermediate terrace of the Dartford cranium by Mr. W. M. Newton. How closely it is allied to the

AN ANCIENT RACE OF TALL MEN

Cro-Magnon type may be seen by comparing it with the specimens found in France. The brain capacity of the Dartford cranium is 1750 cc., at least 250 cc. above the average of modern men. The French specimens also show an equally great capacity ; in one case Verneau estimates the brain chamber to be capable of holding 1800 to 2000 cc. The length of the skull is great ; in the Dartford skull it is 207 mm. ; in the five French skulls the length varies from 194 to 211 mm. ; in length the skull rivalled or outstripped the crania of the Galley Hill—a race which appeared long before the Cro-Magnon in Europe. In the width of the skull there is a great difference in these ancient types ; in the Galley Hill type the width varies between 130 and 140 mm. ; in the Cro-Magnon it varies between 140 and 150 mm. In the Dartford specimen it is 150 mm. Most of the Cro-Magnon skulls, although wide, are only of medium height ; the highest point in the roof is usually not more than 120 mm. above the ear passages. The forehead is wide and the eyebrow ridges well marked. The contour of the back of the head is characteristic. As in the Galley Hill race the occipital part of the head projects rather prominently, but the crown of the head, in place of arching upwards from the occiput as in the Galley Hill race, is flattened, as if the upper and back part of the crown had been plastic and struck by a spade. Unfortunately in the Dartford specimen the face is missing,

ANCIENT TYPES OF MAN

and it is in the face as well as in the stature that the characteristics of the race are to be found.

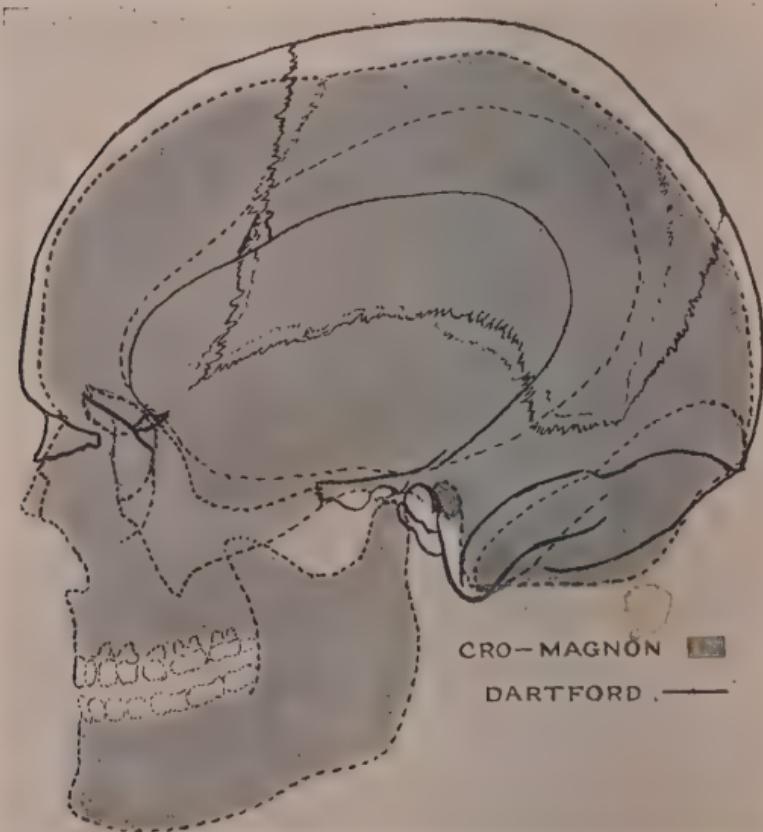


Fig. 13. Profile of a Cro-Magnon skull with the outline of the Dartford cranium traced on it. (One-third natural size.)

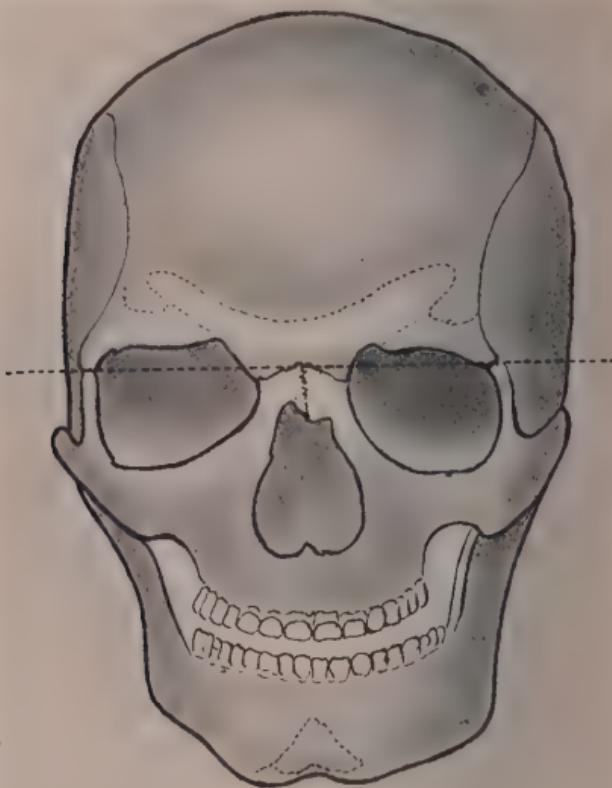
Thus, such evidence as there is in England, and admittedly the evidence is slight, points to the existence of the Cro-Magnon race in England at

AN ANCIENT RACE OF TALL MEN

a period long after the Galley Hill race. It is in France itself that we find evidence as to the period at which the Cro-Magnon men appeared in Europe. Their brains were large, and we naturally expect signs of a high mental development. In their hands art reached a stage of realism which has never been surpassed; they engraved the animals they hunted on bone and ivory with the accurate eye and hand of the true artist. Their implements of flint and bone are characteristic; hence the strata in the floors of caves formed during the time of the Cro-Magnon race can be recognized. The chief period of the Cro-Magnon race is named the Magdélénién, because in the La Madeleine rock shelter in the valley of the Vézère, three miles above Cro-Magnon, remains of their civilization are found abundantly. The strata of the Magdélénién Period lie superficial to, and are more recent than, the Aurignacien strata in which Hauser found the long and narrow headed Combe-Capelle man (Fig. 10, p. 52), who appears to represent the Galley Hill race in the south of France. In the long interval between the Aurignacien and Magdélénién, a third epoch is sometimes distinguished—the Solutréen. The Cro-Magnon type is also found in this period. The Cro-Magnon race thus appears in Europe later than the Galley Hill type, but it is discovered with its art and its great physique already in full development. Its cradle and the place of its

ANCIENT TYPES OF MAN

evolution have not been found as yet, but from many points in structure which recall the Mon-



CRO-MAGNON TYPE.

Fig. 14. Face view of the Cro-Magnon Race.
(One-third natural size.)

golian type we may expect to find the earlier history of the Cro-Magnon race when our researches have been carried into the centre of

AN ANCIENT RACE OF TALL MEN

Asia and the Far East. The wide, short face, the extremely prominent cheek bones, the spread of the palate and a tendency for the upper incisors to project forwards, and the narrow-pointed chin, recall a facial type which is best seen to-day in tribes living in Asia to the north and to the south of the Himalayas. In some features, especially as regards their stature, the Cro-Magnon race recall the Sikhs living to the south of the Himalayas. To some extent they resemble the Esquimaux, a people that now represent the Magdelenien grade of civilization.

The explorations of the caves on the shores of the Riviera near Mentone, under the auspices of the Prince of Monaco, have extended our knowledge of the Cro-Magnon type. The remains of the two negroids of Grimaldi, it will be remembered, were found in the Grotte des Enfants below strata which had accumulated in the course of long ages to a depth of $8\frac{1}{2}$ metres—over 28 feet. The Grimaldi remains rested on a stratum which was evidently formed in a warm period, for it contained the remains of animals which we associate with a semi-tropical climate. In a stratum nearly 3 feet above the one containing the negroids was found the skeleton of a splendid specimen of the Cro-Magnon race. Remains of the fauna of a cooler climate then appear. If the reindeer then sought the climate it now prefers we may conclude that the temperature of the south of France resembled

ANCIENT TYPES OF MAN

that which now prevails in the north of Europe and did so for a long period, for in the strata formed over the Cro-Magnon burial, to the extent of 20 feet, remains of the reindeer occur. There is evidence to show that the Cro-Magnon type persisted in Europe throughout the long period marked by the presence of the reindeer.

The Cro-Magnon man was tall ; the individual found in the Grotte des Enfants stood about 6 ft. 3 in. in life. His long collar bones show he was wide-shouldered, with a great breadth of chest. His thigh bones were long and straight and their shafts shaped like a razor, so strongly pronounced was the ridge for the attachment of muscles on its posterior aspect. The leg bones, or tibiae, as in the Grimaldi and in negroid races, were relatively and absolutely long. There are in this and a number of other features—the short, wide face, the prominent cheek bones and pointed chin—also traces of the negroid in the Cro-Magnon race.

By the end of the reindeer period the Cro-Magnon race seems to have been absorbed by other races. The type has been identified amongst the Neolithic inhabitants of Switzerland. In form of head the natives of England who buried their dead in long mounds or barrows have much in common with the Cro-Magnon race. Although there is no race in Europe to-day that can be regarded as representative of this Paleolithic people,

AN ANCIENT RACE OF TALL MEN

yet in Germany, Switzerland, France, and Britain individuals of this type are not rare. They are the tall men of commanding mien. It is likely enough that Cro-Magnon blood may be in their veins, but time and civilization have lengthened their faces, reduced the prominence of their cheek bones, diminished the strength of their jaws, and opened out their eye-sockets, thus removing the lowering sour visage which characterized the Cro-Magnon face.

CHAPTER VIII

THE ROUND-HEADED TYPE

UNTIL the last chapter the various types of man were followed in orderly sequence into the far past—from the woman of the buried Neolithic surface of Essex to the Galley Hill man in the 100-foot terrace of the Thames Valley. The period of time thus covered is that involved in the erosion of the deeper part of the Thames Valley, namely, the part below the level of the 100-foot terrace. It was necessary to retrace our steps in the last chapter, so that the Cro-Magnon type might be placed in its proper sequence. It is now necessary to retrace our steps to a more recent period than that considered in the last chapter, to find the appearance of another type—the round-headed or brachycephalic type. In modern times the round or short head is the predominating type in Europe. All the races we have hitherto considered have had long and narrow heads, the form which is still the prevailing type in Britain, the United States, Canada, Australia, New Zealand, Spain, and Norway. It is only 4000 to 5000 years since the round heads

THE ROUND-HEADED TYPE

or Celts appeared in Britain. In the Continent they appeared much earlier. In the limestone caves of Furfooz in the valley of the Lesse, a tributary of the Meuse, the Belgian archæologist, Ed. Dupont, excavated in 1867 two crania—one of a man, the other of a woman. They are the types of the Furfooz race. The remains of the mammoth were embedded in the same layer, so the Furfooz race may have been a contemporary of the Cro-Magnon race, and its appearance must be assigned to the end of the last Glacial Period. The skulls are small, and at once remind one of the "river-bed" type found in England towards the beginning of the Neolithic Period, if not earlier. They are shorter and wider than the river-bed skulls ; in the male the length is only 174 mm., in the female 172 mm. ; the width in the male is 79 per cent, and in the female 81 per cent, of the length. In the opinion of the writer these Furfooz individuals are really of the same race as the "river-bed" people of England, but show a marked tendency to a decrease in the length and an increase in the width of the skull. The Furfooz race was one with small heads and low stature.

To find a purer type of a round-headed people one must go farther east than Belgium, to Grenelle (a western suburban district of Paris), and to Solutre, in the valley of the Rhone near Lyons. From these places Quatrefages and Hamy have described seven skulls found with remains that

ANCIENT TYPES OF MAN

assign them to the same early age as the Furfooz type, but they show a more marked degree of brachycephaly. In all of them the width varies between 83 and 85 per cent of the length. They are markedly and typically brachycephalic ; the posterior or occipital part of the head, instead of forming a prominent backward projection, is pressed forwards and flattened, so that the back of the head seems to rise in line with the back of the neck. The meaning or significance of this occipital flattening we do not know ; all that we are certain of is that it is not a Simian or primitive feature, but one acquired in the course of the evolution of the higher types of man. It is true that in our modern way of describing the head the skulls of the anthropoids are also brachycephalic—the width of the cranial cavity is 80 per cent or more of its length, but in their case the width is due to the fact that the brain is flattened from above downwards. Brachycephaly in the ape and in man are of quite different natures. The important aspect of the discoveries at Furfooz and Grenelle for the anthropologist is the appearance of a round-headed type of man in the north-east of France some considerable time before the present temperate climate settled in Europe. Discoveries have been made showing long-headed races abounded in France, in Germany, in Switzerland, and in Bohemia in early Neolithic times. Now the case is quite

THE ROUND-HEADED TYPE

different ; the round-headed type prevails in these countries ; he seems to be the conquering type. As the Neolithic Period comes to an end, he becomes more and more the predominating type. Since the close of the Glacial Period he has succeeded in ousting his long-headed brother from the larger and richer countries of Europe. Were it not for the discovery of new continents the long and medium-headed races would have cut a poor figure in the world of to-day. We see now that the round heads hold the continents of Europe and Asia from France and Germany in the West to Japan in the East, and from the shores of the White Sea to those of the Mediterranean. As Slav and as Mongolian, he is the dominating type. Within historic and traditional times the invading waves, so far as Europe is concerned, have originated in Russian territory. Russia forms the breeding centre and probably the cradle of the type. The origin of the round head lies far back in the past, and its origin is more likely to be discovered by archæological research in the dominions of the Czar than anywhere else in the world.

REFERENCE.—Quatrefages et Hamy. *Crania Ethnica*. Paris, 1882.

CHAPTER IX

HEIDELBERG MAN

THE various forms of ancient man so far described are modern in their build of body ; were they to appear again on earth they would not be out of place amongst the various present races of mankind. It would be otherwise with the Neanderthal type of man ; he would be altogether out of place in the modern world ; an anatomist could distinguish him at a glance from any modern man, black or white, so many and distinct are his characteristic features. Indeed, the famous anatomist of Strassburg, Professor Schwalbe, proposed to name all the extinct races of the Neanderthal type by the name of *Homo primigenius*, to distinguish them from *Homo sapiens*, to which all modern races, savage and civilized, belong. There is no reason to suppose, however, that the specific differences are so great that representatives of *Homo sapiens* and of *Homo primigenius*, if mated together, would not produce fertile offspring. The supposition we proceed on at the present time is that the Neanderthal type is the precursor and ancestor of the modern type. The

HEIDELBERG MAN

Neanderthal type represents an extinct stage in the evolution of man. Races of the modern type were certainly evolved before the close of the Glacial Period and long before the Thames had cut its bed down to the level of the 100-foot terrace. We may allow a period of at least 200,000 years to have elapsed since the modern type of man appeared: the probability is that his antiquity is infinitely greater, for he is fully evolved when we meet him first. The Neanderthal type was certainly evolved before the beginning of the Pleistocene or Glacial Period, so that the origin of this type preceded the origin of the modern type by many hundred thousand years. Some geologists estimate the length of the Pleistocene Period at $1\frac{1}{2}$ million years.

The earliest trace of the Neanderthal type of man yet found was discovered in the valley of the Neckar, some six miles above the famous German University town of Heidelberg. Only a lower jaw was found, but no single bone can tell more of the body to which it belonged than a mandible. The sands of Mauer in which the jaw was found lie on the south side of the valley of the Neckar, some three and a half miles from the river. The sands were laid down in the bed of the ancient river soon after the Pleistocene Period began. We should never have known the secrets locked up in those Mauer sands had it not been for the happy chance that they are excavated and worked for building purposes. It

ANCIENT TYPES OF MAN

is also fortunate that the owner of these great sandpits was keenly interested in the fossil remains, and gave Professor Otto Schoetensack, of

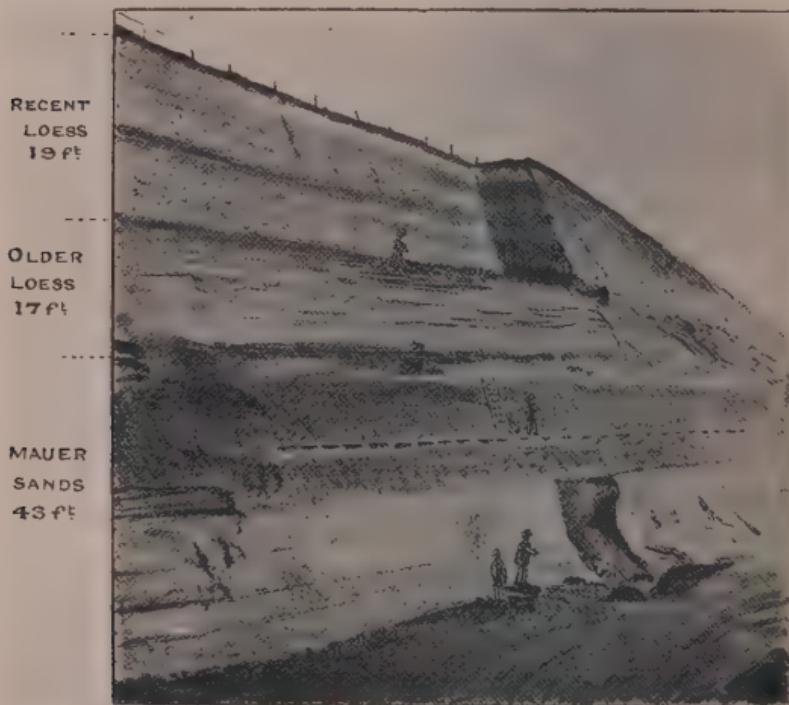


Fig. 15. A diagram of the strata of the pit in which the Heidelberg mandible was found. A cross marks the spot. (After Schoetensack.)

Heidelberg University, every encouragement to examine and record the strange things that were found from time to time. In October, 1907, when the mandible was encountered, the working face

HEIDELBERG MAN

of the pit had reached a depth from the surface of a little over 80 feet. The face shows three formations: an upper deposit about 19 feet in thickness of recent loess—a chalky clay; a second about 17 feet in depth of older loess containing remains of the mammoth and other members of the late glacial fauna; a third, 46 feet deep, consisting of layers of sand laid down by the ancient Neckar. The layer in which the mandible was found is 3 feet from the bottom of the third layer (Fig. 15). It is very evident that an enormous interval of time has elapsed since the lower strata of the Mauer sands were laid down. The animals then living in the central part of Europe were markedly different from the modern forms. Bones and teeth of an extinct rhinoceros (*R. Etruscus*) are found in the same layers as the human mandible, and the presence of this animal shows the sands were laid down near the beginning of the Pleistocene Period. A kind of horse was also found which indicates an early date. The fauna is very similar to that found in the Norfolk beds of England, and they are deeper and much older than the glacial boulder clay. Although many of the animal forms living in the Neckar Valley then have become extinct, others, such as the red deer, the roe deer, and the pig, have come down to modern times unchanged. Man has changed, but to a less extent than anthropologists of a past generation anticipated.

The Heidelberg man had a massive jaw, which

ANCIENT TYPES OF MAN

recalls, both by its size and shape, the anthropoid rather than the modern human bone (Fig. 16). In men of the present day the chin is prominent, projecting in advance of the lower incisor teeth, while in the Heidelberg jaw, as in the anthropoid, the opposite is the case. To the superficial observer the

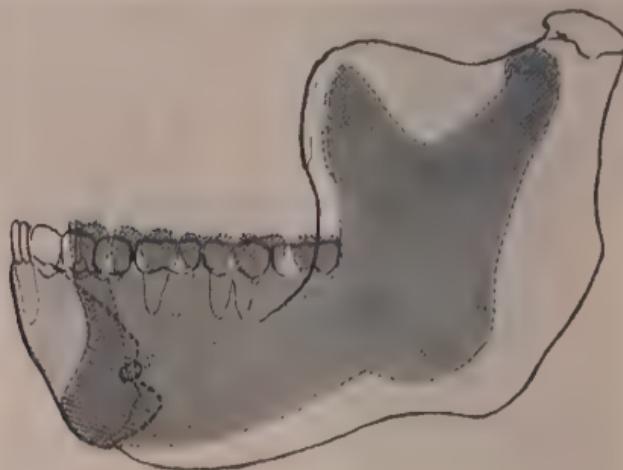


Fig. 16. Profile drawing of the Heidelberg mandible (in outline) contrasted with the lower jaw of a Modern European (shaded). (Half natural size.)

Heidelberg man would appear chinless, but such is really not the case, the teeth and the alveolar, or tooth-carrying part of the jaw, are so strongly developed that they mask the lower or chin part. In modern Europeans the teeth, in the total length of their grinding surface, are 10 mm. ($\frac{2}{3}$ in.) less than in the Heidelberg man. There

HEIDELBERG MAN

has been a reduction in dental development, with the result that the teeth and the alveolar part of the jaw have retreated and left the chin prominent. While the upper or alveolar part of the jaw varies according to the size of the teeth, the lower border of the jaw on which the chin is set varies according to the size of the floor of the mouth. In order to allow a free movement of the tongue and of other parts concerned in speech movements, the lower border of the jaw, which bounds the floor of the mouth, has opened out in modern man. Speech requires that the floor of the mouth should be opened out to give free movements to all those parts concerned in the easy production of speech. Now in shape and size the Heidelberg mandible shows a condition intermediate to the anthropoid and the modern human forms. The anthropoid jaw is the primitive one ; the mandible is framed to serve the purpose of mastication ; the mandible of modern man is modified to serve in speech. In the Heidelberg man we must admit that the mandible is mainly adapted for mastication. The various modifications we associate with speech are also there, but in a partially developed condition. The anatomical features of the mandible indicate that human speech, of a primitive nature, may have been present in this early form of man. At least we reach in the Heidelberg remains a point in the evolution of man where the possibility of speech may be called in question.

ANCIENT TYPES OF MAN

From the Heidelberg jaw we learn that the human mechanism of mastication was fully evolved at the beginning of the Pleistocene Period. The canine teeth which are so large and prominent in all forms of anthropoids have in the Heidelberg



Fig. 17. Profile of the Heidelberg mandible (outline) contrasted with that of the mandible of a chimpanzee (shaded). (Half natural size.)

specimen subsided to the level of the neighbouring teeth in the dental series. We must assume that at one period in the evolution of man the canines were prominent and pointed as in the anthropoids, for it is only on such a supposition that the peculiar form of the human canine teeth, and their position during development, can be explained.

HEIDELBERG MAN

To understand the retrogression of the canine teeth in man it is necessary to understand the mechanism of mastication in anthropoids and the part played in this act by these great teeth. In anthropoid apes the muscles of mastication are extremely strong, so that the toughest and most resistant of edible things can be crushed between the teeth. In exercising great force there is a tendency for the lower jaw to skid or slip sideways, but such a movement is prevented by the prominent canines coming into contact as the jaws close, thus preventing a false lateral movement.

The canines may serve as organs of defence or of attack in the anthropoid as in the dog, but their main purpose is that of dental guides for the jaws. The peculiarity of the mastication in the ancient forms of man was the side-to-side and oblique movements of the lower jaw whereby the food was crushed and pulverized between the upper and lower teeth. Such chewing movements were impossible so long as the canine teeth projected beyond the level of the other teeth. The retrogression of the canine teeth in the primitive human stock and the evolution from the anthropoid to the early human mechanism of mastication must be sought for in the Pliocene Period or even earlier. In early Pleistocene man the evolution of the human dentition was already completed.

A study of the Heidelberg mandible shows how

ANCIENT TYPES OF MAN

rough and tough the precarious diet of this early race of man must have been. The part of the mandible which ascends to become jointed with the base of the skull and to receive the attachment of the muscles of mastication is of enormous size. The area of its outer surface is 34 cm^2 , that of a modern man is 18 cm^2 , a little more than half. The masseter muscle corresponds in size to the outer surface of the ascending ramus ; we may assume that the surface area of the masseter was twice that of the modern muscle and its thickness was correspondingly great. The masseter was three or four times greater in the Heidelberg man than it is now in most Europeans ; hence the massive and strong build of his jaw. The crowns of the teeth, however, are not particularly large, nor are they peculiar in shape. Certainly a small proportion of modern Europeans and a large proportion of negroid races can show more massive teeth. Even at this early point in human evolution the crowns of the teeth had assumed a truly human character in size and form, but it was otherwise with their roots. It is plain that the great strain to which the teeth would be subjected in side-to-side and oblique movements executed by extremely stout chewing muscles makes a firm and strong implantation in the jaws a necessity. Hence we find the necks and roots of the Heidelberg teeth are peculiar. Their necks are almost as large as their crowns, and the roots have be-

HEIDELBERG MAN

come so massive, strong and thick that they have grown together. In modern molars the roots of the hinder teeth are apt to fuse, but in this case the fusion is due to an actual approximation of the roots, a result of retrogression ; in the ancient Heidelberg man the fusion was the result of over-growth. So peculiar are the roots, so unlike the same structures in the modern type of man and in anthropoids, that Dr. Adloff thinks the Heidelberg man, and the Neanderthal type to which he belongs, cannot be regarded as a stage in the evolution of modern man. In the writer's opinion the form of root just described is a specialization which appeared and subsequently disappeared when the special adaptation was no longer required. The case is similar to the biceps of the blacksmith ; the hypertrophy disappears when vigorous demands cease to be made on it. When knowledge ameliorated the quality of the human diet, the overgrown condition in the roots of the teeth disappeared.

Although we know only the lower jaw, the size and shape of the palate of the Heidelberg man can be inferred with some degree of accuracy. The arrangement and size of the teeth in the upper jaw have a definite relationship to those of the lower jaw ; hence we may estimate the size of the palate from the lower teeth. The area of the Heidelberg palate was about 3600 mm^2 , whereas the area of the palate of an average modern Englishman is

ANCIENT TYPES OF MAN

only about 2600 mm². The length of the palate, when measured from between the crowns of the central incisors to a point midway between the posterior borders of the last molars, must have been about 62 mm. in the Heidelberg man, while in the modern English palate the length is 54 mm. The width of the palate as measured between the outer borders of the second molar teeth was probably 72 mm. in the Heidelberg man ; in the modern Englishman it measures on the average about 58 mm. The feature of the Heidelberg palate was its absolute and relative width. In anthropoids the outstanding feature of the palate is the great length, absolute and relative. The width of the palate in the early Neanderthal type of man was probably due to the side-to-side movements in chewing. The evolutionary forces then at work had a tendency to widen and not to elongate the palate, and thus to obtain a wide but not a projecting or prognathous development of the upper jaw. The jaws of these early human beings were primitive enough, but certainly not simian. At even this early stage the simian condition was long past. It is a remarkable fact that there is a tendency to narrowing of the palate and jaws in modern civilized races.

From the Heidelberg lower jaw it is possible to give an approximate reconstruction of the whole head. The manner in which the upper teeth can be placed in position and the size and shape of

HEIDELBERG MAN

the palate estimated have just been mentioned. The condyle of the jaw gives the situation of the

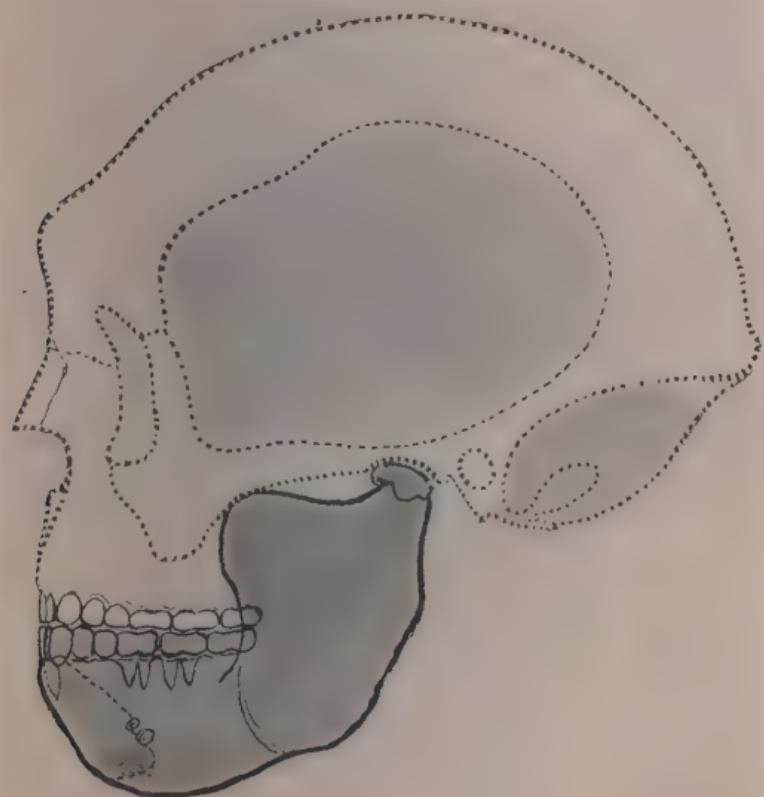


Fig. 18. Heidelberg mandible with attempted reconstruction of the head. (One-third natural size.)

maxillary articulation on the base of the skull. To this joint the ear, the mastoid process, and the root of the zygomatic arch, from which the mas-

ANCIENT TYPES OF MAN

seter muscle arises, bear definite and constant relations. The width of the ascending ramus of the jaw gives a clue to the termination of the zygomatic arch on the face and affords certain indications of the size of the orbit. The width of the jaw, between its condyles, affords an indication of the breadth of the base of the skull. When, however, we begin to construct the roof-part of the skull we have to fall back on certain definite rules which have safely guided men in the past when reconstructing extinct forms. The rule is that of correlationship of parts ; the bones of any animal form parts of a harmonious mechanism ; if the type of animal is known, then the discovery of a single bone indicates the nature and form of the whole skeleton. Now there can be no doubt as to the nature of the Heidelberg jaw ; it is of the form known to occur in the Neanderthal type of man. It is certainly stronger and more massive than any sample yet found, but nevertheless one can be absolutely certain that the head form of the Heidelberg man was of the Neanderthal shape (Fig. 19). In Neanderthal man the skull was peculiarly fixed to the neck of the individual. The head was tilted backwards and carried permanently in this manner, so that the muscles of the neck were attached much higher up the occiput than in modern races. In modern man, as in the young of anthropoids, the head is balanced or evenly poised on the neck. In races of the

HEIDELBERG MAN

present day this poise continues throughout life, but in Neanderthal man, as in anthropoids, the position of the head to the neck changed as adult years were reached. The sterno-mastoid muscles which play a leading part in balancing the head on the neck are attached to bony elevations

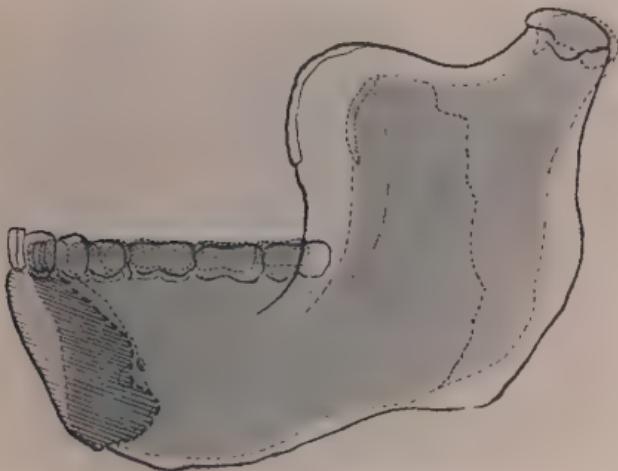


Fig. 19 Profiles of the Heidelberg (outline) and Spy (shaded) mandibles superimposed for comparison. (Half natural size.)

situated just behind the ear, known as the mastoid processes. They vary in shape according to the manner in which the head is fixed to the neck. Hence in Neanderthal man the mastoid processes are quite unlike the pyramidal-shaped processes of modern races. Indeed, they at once recall the same processes in the gorilla skull. In the manner

ANCIENT TYPES OF MAN

of head fixation Neanderthal man retains a distinct trace of the anthropoid form. The tilting back of the head and its carriage in this position is a necessary result of great jaw development. To make room for a large mandible with a correspondingly large tongue and throat, the head must be held in a position of backward extension. The erect poise of the head in modern man is a direct result of the reduction in the masticatory apparatus. As early as the Galley Hill man, and probably long before his time, this reduction had been accomplished.

To carry such a jaw as the Heidelberg the breadth of the base of the skull must have been approximately 145 to 150 mm. wide and its length over 200 mm. These are dimensions known to occur in the Neanderthal type of man. The skulls were extremely massive. The strong ridge of bone which crossed the forehead just over the orbits we may be certain was present, because the great muscles of mastication demand this additional strengthening of the face. The supraorbital ridge (*torus supraorbitalis*) is a characteristic of the Neanderthal type of man. When, however, we come to estimate the brain capacity of the Heidelberg cranium, we find the data at our disposal are insufficient to give any certain indication. Although the mandible is more massive and more primitive in form than those of known Neanderthal individuals it is exactly of the same type,

HEIDELBERG MAN

and we may infer that the brain capacity was probably less but not greatly less. Now it has become known in recent years that we greatly underrated the brain development of the Neanderthal race; they had large brains. Indeed, in some instances they are markedly above the modern average. If, therefore, we assign a cranial capacity of 1300 cc. to the Heidelberg man we shall probably be under rather than above the truth. Thus the earliest trace of the skeleton of man yet found in Europe must be assigned to a period which carries us back many hundred thousands of years, almost to the beginning of the geological epoch which preceded the present. Yet even at that early date we find man already evolved, brutish perhaps in appearance, savage no doubt in his nature, yet large-brained, erect in posture, and in every sense of the biologist—a man.

REFERENCES.—Prof. Otto Schoetensack: *Der Unterkiefer des Homo Heidelbergensis*. Leipzig, 1908.

Prof. George G. MacCurdy: "Recent Discoveries Bearing on the Antiquity of Man in Europe." *Smithsonian Reports*, 1909, pp. 531-83.

CHAPTER X

KRAPINA MEN

THE discovery of the Heidelberg mandible was made in 1907. In the previous year Professor Karl Gorjanovic-Kramberger—known to his German colleagues as G. K.—published a magnificent memoir, in which he gave an account of the remains of a very ancient people discovered in the Hungarian Province of Croatia. It is important to note the scene of the discovery. Soon after the Save, one of the largest tributaries of the Danube, crosses the north-west frontier of Croatia, it is joined by the Krapinica, a small river on which the village of Krapina is situated. A little way above Krapina the stream flows through a glen with steep sides of sandstone rock. It was on the western side, 80 feet (25 metres) above the present level of the stream, that remains of the Krapina men were found. Extensive explorations made between 1899 and 1905 revealed an ancient cave completely filled up and obscured by strata 26 feet in thickness, which had been laid down when an extinct form of rhinoceros (*R. merckii* or *leptorhinus*) and a Neanderthal type of man were living in Croatia. This form of rhinoceros is not so

KRAPINA MEN

ancient as the Etruscan species found with the Heidelberg man, but it is older than the woolly rhinoceros (*R. tichorhinus*), which flourished with a Neanderthal man at a later date in the Pleistocene Period of France and Belgium. A rough indication of the antiquity of the cave strata may be obtained from the erosion of the valley. The strata on the floor of the cave were deposited by the Krapinica ; since then that stream has worn out a valley in the sandstone 80 feet below the level of the floor of the cave. The ice sheet never reached Croatia, so we must regard the erosion of the valley as the work of the stream alone. While the strata on the floor of the cave were laid down by the stream the upper layers of the cave or rock shelter were formed by débris which had fallen from time to time from the overhanging cliff. In these strata as many as nine distinct levels or floors were noted containing signs of human habitation. Traces of hearths were found as deep as the stream-formed layer on the floor of the cave. Stone implements occurred throughout of a primitive type ; some implements crudely shaped from the splintered bones of the rhinoceros were found. Remains of the cave bear abounded, many of the bones being half burned, and all split or broken. Over 230 human teeth and 200 fragments of the human skeleton were recovered during the excavations. The conditions of some of the fragments suggested to their discoverer that these human

ANCIENT TYPES OF MAN

bones were remains of cannibalistic feasts. At least, no complete human bone was found, and there were no signs of burial. From the fragments found, representing at least ten individuals, a fairly complete picture can be formed of the ancient race of Krapina.

The Krapina men are later than the Heidelberg, but how much later it is difficult to say. The animals which accompanied them represent a more recent fauna than those found in the Mauer sands. No implement or product of the Heidelberg man's workmanship is known. The implements of the Krapina men, according to Rutot's judgment, vary widely as regards their design ; some are of a kind belonging to a period which antedates the Mousterien Period—the one in which the Neanderthal race flourished in France, while others are of the Aurignacien Period, which followed the Mousterien. The Krapina implements do not help us much as regards date. Two things are manifest, however : (1) that the shelter or cave excavated by Kramberger must have been the home of man for many generations—a floor which is composed of 24 feet of debris is not quickly formed ; (2) the fragments of the skeleton found in these strata are sufficient to show that, with a great variety of form as regards age, sex, and individuals, there is the same type throughout. The men of Krapina represent a variant of the Neanderthal type.

KRAPINA MEN

The Heidelberg and Krapina men are probably separated by a long interval of time, apparently represented by one of the many climatic revolutions which divide the Glacial Age into three or more periods. If we assign the Heidelberg man to the first Interglacial Period, we should place the Krapina man in the second. The Krapina man had discovered the use of fire, a discovery which must lead to a radical change in the nature of human diet and to the conditions of life. One can understand how such a discovery may lead to a complete alteration in the bodily development of man in the course of many generations.

Besides many fragments, a complete lower jaw was discovered. In all its dimensions, except two, this Krapina jaw is smaller than the Heidelberg example. The two characters in which it exceeds that specimen may be mentioned first. The depth of the jaw at the symphysis or chin in the Heidelberg specimen is 33 mm., not much more than is usual in modern jaws; in the Krapina specimen the symphysial depth was 42 mm. In the Krapina mandible the condyles of the jaw were set half an inch wider apart than in the Heidelberg, and an inch more than is usual in modern men. That indicates a very wide base to the skull. In all other dimensions this singular jaw from Krapina is less than the Heidelberg: there was clearly a smaller development of the muscles of mastication. The Krapina palate was also smaller than the

ANCIENT TYPES OF MAN

Heidelberg one. In length it varied from 55 to 62 mm., and in width from 66 to 73 mm. The teeth, however, retain the peculiar roots, and in the dimensions and characters of their crowns they exceed those of the Heidelberg man and resemble some of the modern negroid races. The mandibles varied greatly in size and character amongst the Krapina folk ; some as regards their ascending ramus did not differ very much from modern races, but these were probably the bones of women.

It is at Krapina we obtain our first glimpse of the difference in the build of the body in man and woman, and it is there, too, we get our knowledge of children of the Neanderthal race. The women were of a much lighter build than the men ; the supra orbital ridges were less developed and less simian. The bones of the skulls were thinner, the jaws less massive and robust in the women, and the thigh bones of the two sexes showed as great, if not greater differences than are seen in modern races. In early man, as is also the case among anthropoids, the male was endowed with a more massive, robust, and brutish body than the female. In the progress towards the modern type, children lead the way, women follow, and men bring up the rear.

Although no complete or even approximately complete human skull was found at Krapina, it is clear that they differ very materially from all other Neanderthal crania which have been discovered. They are shorter, the longest being 197 mm., and

KRAPINA MEN

the common length appears to have been 190 mm., or in some cases much less. In specimens of the Neanderthal race found in other parts of Europe, the length is usually over 200 mm. On the other hand, the Krapina heads were wide; the common width was evidently about 145 mm., but in some cases it amounted to 165 mm. The width of the head varied from 75 to 85 per cent of the length, so we have here clear evidence of a tendency to round-headedness or brachycephaly. The skulls of anthropoids are brachycephalic and also flattened on the top, so that a cast of the brain cavity appears flat and wide. This was also the case in the Krapina men. Flattening of the top is a character of the Neanderthal head. As regards the size of the brain the Krapina men had a fair endowment, the cranial capacity probably varied between 1300 and 1500 cc., not very different from that of modern men.

We have only one fragmentary specimen to guide us in framing a picture of the face. So far as this specimen can be reconstructed, it is so similar to the completely preserved face of the Gibraltar skull that its description may be postponed until that example is described. It is enough at present to say that the face was massive and particularly long, the eye-sockets were spacious and surmounted by beetling brows, the cheeks were full; but although the jaw was wide and massive, there was no projecting muzzle as in the ape. As to the

ANCIENT TYPES OF MAN

colour of the skin, one can say nothing for certain, but the characters of the teeth are those we now see in negroid races, and I for one would be surprised to know that the skins of the Krapina men were European in complexion. If not so dark as in the typical negro, they were probably pigmented. It must be remembered that we are dealing now with a type of men which preceded all races of the modern type. All the evidence at present at our disposal points to the fair-skinned European as one of the latest products of human evolution. The common ancestral stock from which every modern race is descended must have been negroid in nature. It is possible that the Neanderthal type of man may represent such a stock.

REFERENCE.—Prof. Karl Gorjanovic-Kramberger :
Der Diluviale Mensch von Krapina. Wies-
baden, 1906.

CHAPTER XI

NEANDERTHAL MAN

ON the north side of the valley of the lower Rhine, between Düsseldorf and Eberfeld, a deep gorge, known as Neanderthal, has been cut in limestone rocks, by a small tributary of the Rhine. On the south side of the gorge, some 60 feet above the level of the stream and 100 below the top of the cliff, there is a small cave in which the remains of the Neanderthal type of man were first discovered. The discovery was made in the spring of 1857. Certain bones found in the loam of the floor of the cave, at a depth of 4 or 5 feet, came into the possession of Dr. Fuhlrott. So unfamiliar were they in appearance that several weeks elapsed before their owner recognized them as human. Fairly complete examples of all the long-limb bones were found as well as the roof or calvaria of a skull. In 1858 Dr. Schaafhausen, a skilled anthropologist, published an excellent account of the bones thus discovered, and from that date to this these human remains have puzzled and fascinated anatomists throughout the world and been the subject of many an acrimonious dis-

ANCIENT TYPES OF MAN

pute. Huxley recognized in them the features of a new and very ancient type of man ; Virchow said they were the bones of a modern man suffering from a peculiar disease ; in later days Professor Schwalbe applied to them his new methods of investigation, and declared the Neanderthal remains to be the prototype of an extinct kind or species of man. To this species he gave the name of *Homo primigenius*, in distinction to the modern type to which the name of *Homo sapiens* is restricted. We know now that the men who lived in Europe during the earlier and greater part of the Glacial Period—one estimated to have extended over a period of from 500,000 to 1,500,000 years—were of the Neanderthal type.

After the discovery of a human skeleton in the cave at Neanderthal attempts were made to obtain evidence as to the probable antiquity of the remains. In the strata of the floor of a neighbouring cave, bones of the mammoth (*Elephas primigenius*) and woolly rhinoceros (*R. tichorhinus*) were found ; the presence of these animals indicates a date towards the end of the Glacial Age, probably the third and last of the interglacial temperate periods. The date of the Neanderthal man would thus be later than the Krapina race, which has been assigned to the second Interglacial Period. More recently, however, Konstantin Koenen has found evidence in Neanderthal that makes it possible to assign these Croatian and South German repre-

NEANDERTHAL MAN

sentatives of the Neanderthal type to the same period.

A comparison of the calvaria of the Neanderthal

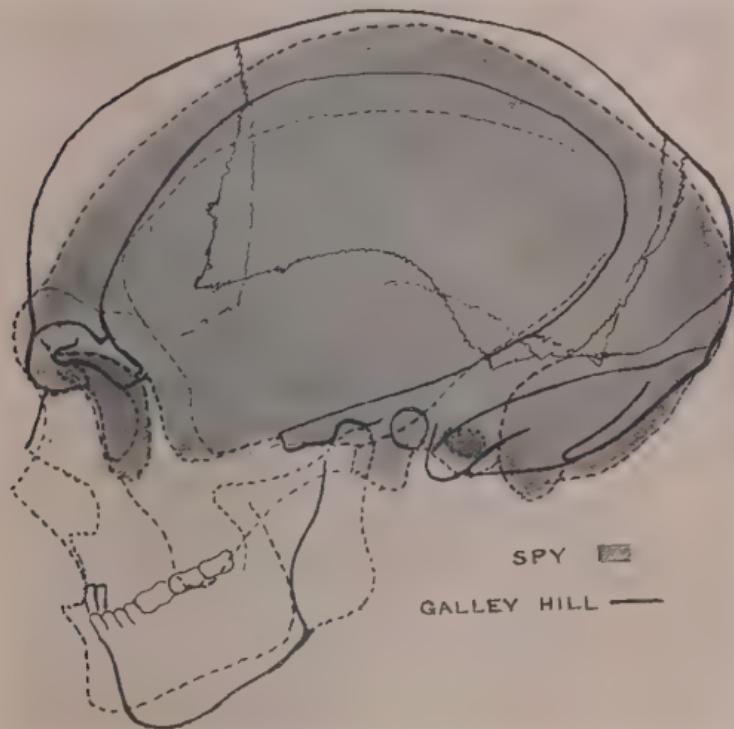


Fig. 20. Outline of Neanderthal form of skull (shaded) compared with the Galley Hill type (outline). (One-third natural size.)

skull with the corresponding part of the Galley Hill man will bring out its peculiar features. Both are very long skulls, the Neanderthal being 203 mm., the Galley Hill some 2 mm. more.

ANCIENT TYPES OF MAN

The factors which make up the length are different : in the first-named, the brain amounts to 174 mm. of the length, the additional 29 mm. being due to the thickness of the skull bones ; in the Galley Hill type the brain factor amounts to 187 mm., the bones 18 mm. In the one case the great length is due to the thickness of the skull, in the other to length of brain. The supra-orbital bar of bone which crosses the forehead of the Neanderthal skull above the orbits is so thick that it makes up 23 mm. of the total length, while in the Galley Hill man the supra-orbital thickness amounts to only 13 mm. The supra-orbital bar or torus is a feature of the Neanderthal type, and, as has been already explained, its development is related to the great forward growth of the muscles of mastication on the frontal region. The extreme width of the supra-orbital bar as measured from one side of the forehead to the other is 126 mm. in the Neanderthal calvaria, and only 106—a modern width—in the Galley Hill. The great size of the supra-orbital torus gives the forehead of the Neanderthal man a receding appearance, and this is emphasized by its great width just above the eyes.

A comparison of the manner in which the skull is hafted or fixed to the neck brings out another important difference between the Neanderthal man on the one hand, and the Galley Hill and modern man on the other. The permanent tilting

NEANDERTHAL MAN

back of the head in the more ancient type has already been mentioned, so has the upgrowth of the muscles on the occiput of the head. Thus it comes about that in the Neanderthal skull the inion which marks the upper limit of the attachment of neck muscles is 20 to 25 mm. above the upper limit of the cerebellum. In modern men the inion is just below the upper level of the cerebellum. The failure to recognize this important difference in the position of the inion has led to an under-estimation of the height of that part of the skull which contains the cerebrum. If the height of the skull is measured from the level of the inion the Neanderthal skull appears very low and thus comparatively small ; but if—in a more correct way—the posterior-inferior angle of the parietal bone is taken to mark the lower cerebral level, then the height of the Neanderthal and Galley Hill crania are not very different ; in the first the cerebral height is 100 mm., and in the second 97 mm. As regards width of brain and skull the Neanderthal is the greater ; the skull-width is 150 mm., the brain-width is 138 mm. In the Galley Hill man the width of the skull is 12 mm., and the brain 8 mm. less. The size of the cranial cavity in the Neanderthal type was much under-estimated. In place of being 1230 cc., as Huxley supposed, it is over 1500 cc., as Manouvrier and Boule have estimated. It is a striking fact that the brain had reached, as regards size, more than a modern

ANCIENT TYPES OF MAN

degree of development in the Neanderthal type ; indeed, 1480 cc. is usually accepted as an average for modern man.

It was not only in the massiveness of his skull and jaws that Neanderthal man was peculiar. The bones of his limbs were very thick and rather clumsy as well as short. The difference is well illustrated by comparing his thigh bone with that of a modern man of average height, 5 ft. 8 in.—



Fig. 21. Thigh bone of Neanderthal (outline) and modern man (shaded) contrasted. (One-fifth natural size.)

1720 mm. In the Neanderthal man the femur was 438 mm. long, and the height of his massive body is estimated to have been about 5 ft. 4 in. (1620 mm.). The limb bones were shaped differently to ours. The head of the femur and its lower end which forms part of the knee-joint are larger and more clumsy in their build than in the femur of modern man. All the joints of the body were big. The shaft of the thigh bone of modern man is rather straight and compressed from side to side ; in the Neanderthal bone the shaft has

NEANDERTHAL MAN

a marked bend forwards in the middle, and is much wider from side to side than from before backwards. The explanation of these features given by Fraipont is probably correct. Modern man, when he comes to the position of "Attention" has no difficulty in completely extending his legs at the knee-joint, but such a movement would have been very difficult for a Neanderthal man in whom the knees were kept slightly bent even when standing and walking. Still, it is not correct to say he had not attained the upright posture. He walked, as modern men have a tendency to do, with his knees always bent to a slight degree, maintaining his posture by the action of muscles, depending less on the check action of ligaments than is the case with modern men. As in all ancient human races the right humerus was more massive and stronger than the left. The impressions for the attachment of muscles were more marked on the right bone than on the left, showing that, at this early date, the right arm was the more specialized. Man was already right-handed.

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ANCIENT TYPES OF MAN

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CHAPTER XII

NEANDERTHAL MAN IN BELGIUM AND FRANCE

LEAVING Neanderthal and turning southwards across the valley of the Rhine, a journey of one hundred miles brings the traveller into the valley of the Meuse, in the south of Belgium. In this valley near Liége, Professor Schmerling discovered the Engis skull in 1833. That skull, which we have seen is intermediate to the Galley Hill and river-bed types, was found in the floor of a limestone cave with remains of the mammoth and woolly rhinoceros. Some fifty miles further south in the same valley remarkable discoveries of Neanderthal man were made. In 1865, eight years after the discovery at Neanderthal, Dr. Ed. Dupont discovered part of a mandible which we know now must have belonged to an ancient representative of the Neanderthal race in Belgium. It was found in the strata of the floor of the limestone cave at La Naulette at a depth of 36 feet, with remains of the mammoth and woolly rhinoceros. From the characters of the jaw we judge it to be that of a woman, but the teeth are large. In the same district were discovered the

ANCIENT TYPES OF MAN

remains of the two men of Spy, perhaps the most important discovery of Neanderthal man yet made. In the parish of Spy, not far from Namur, is a wooded limestone hill, of no great height. A small stream, the Orneau, flows past its base. On the southern face of the hill, some sixty feet above the level of the stream, there is a cave in the limestone rock, with a mound-like terrace in front of it—just such a cave and cliff as ancient man loved to make his home. For our purpose he could not have chosen a better site than a limestone cave, because the drip of the water from the roof soaks into and preserves whatever organic thing it happens to fall on. In 1885 Marcel de Puydt and Max Lohest began to explore the strata on the terrace in front of the cave. The strata of the terrace were composed of débris which the weather had detached from the face of the cliff, and which had been tramped down by generations of ancient men. The upper 9 feet were barren, yielding no traces of human habitation ; but below this upper layer the explorers entered a second, between 2 and 3 feet in thickness, which yielded remains of the mammoth and reindeer. Below the second was a third layer, with remains of charred wood, of hearths, and of human habitations. In the fourth layer, immediately above the floor of the old cave, which became more and more exposed on the terrace, as the overhanging cliff crumbled away, there were found two male human skeletons.

NEANDERTHAL MAN IN BELGIUM

From the position of the remains the explorers concluded that these two men had been buried. They were of the Neanderthal type. Evidence of their civilization was also found ; their flints are of the form ascribed to the Mousterien Age, but instruments of ivory and of bone, with engravings on the same material, show a degree of progress when a comparison is made with the civilization of the Krapina men. It is said that fragments of pottery were also found ; that may be so, but it is possible that these fragments may have been obtained from the more superficial strata, for in 1885 our exploratory methods were still rather crude. Bones of the woolly rhinoceros, of the mammoth, hyæna, cave bear, pig and Irish elk also occurred in the same stratum as the human remains. The fauna and the civilization are not so very different from those of the Engis man, and yet the whole cycle of a Glacial Period probably lies between them.

Fraipont and Lohest published an excellent description of the Spy men in 1886 ; since then the bones have been studied by several anatomists, especially by Professor Klaatsch, of Breslau. The two men of Spy are spoken of as No. 1 and No. 2. The head of No. 1 is almost a replica of the Neanderthal man ; No. 2 shows also the Neanderthal characters, and yet he also shows distinct tendencies to the assumption of a more modern

ANCIENT TYPES OF MAN

form. In No. 1 the length, width, and cerebral height are the following: 205, 147, and 97 mm. In No. 2 the corresponding measurements are 198, 153, and 107 mm. No. 2 has a remarkably high head, the width is 77 per cent of the length—an inclination to round-headedness, while in No. 1 the width index is the same as in the type specimen found in Neanderthal, namely, 71 per cent. The brains of the Spy men were large, they varied between 1500 and 1650 cubic centimetres, being above the modern average. We of a later generation, with a fertility of mechanical invention, can little understand the great brain which was necessary to make the first steps towards human civilization. The first stages of any new endeavour are notoriously the most difficult.

The men of Spy, if large-brained, were rather less than the Neanderthal man in stature—they were only a little over five feet, but their bones show the same stout and massive type and the same curious carriage of head and body. The head of Spy No. 2, as already said, shows a tendency to assume more modern characters. In both, the teeth are of a more modern type than those of the Heidelberg and Krapina men. The size of the necks of the teeth and the form and dimensions of the roots are rather of the present-day character. Their palates and jaws were smaller. If we assign the Heidelberg remains to the first interglacial epoch and the Krapina to the second, we may, I think,

NEANDERTHAL MAN IN FRANCE

place the Spy men about the opening of the third period. At least there are signs in the structure of the body and in the degree of civilization that point to the men of Spy as being distinctly later in date than those considered in the two preceding chapters.

In the south-west of France, some five hundred miles from the habitat of the men of Spy, three remarkable discoveries of men of the Neanderthal type have been made in quite recent years. The limestone cliffs and terraces which flank the upper valley of the Dordogne and of its tributary, the Vézère, the region where the remains of the men of the Cro-Magnon and Galley Hill types were found, were also the scene of these recent and important finds of Neanderthal man. In the beginning of 1908, Herr O. Hauser discovered in a cave near the village of Le Moustier, on the Vézère, the skeleton of a lad, clearly of the Neanderthal type. The skeleton thus obtained was investigated and described by Professor Klaatsch, of Breslau. The lad was buried in a sleeping posture, with flints of his period laid with him. Later in the same year, also in a floor of a cave, MM. les Abbés J. Bouyssonie and A. Bouyssonie and L. Bardon found the skeleton of an old man also of the same type near the village of La Chapelle-aux-Saints, some distance to the east of Le Moustier, in the Department of Corrèze. The skeleton was examined by Professor Boule. In the following year a

ANCIENT TYPES OF MAN

third skeleton was discovered by M. Pergrony in the site of an old rock shelter at Ferrassie, also in the valley of the Dordogne.

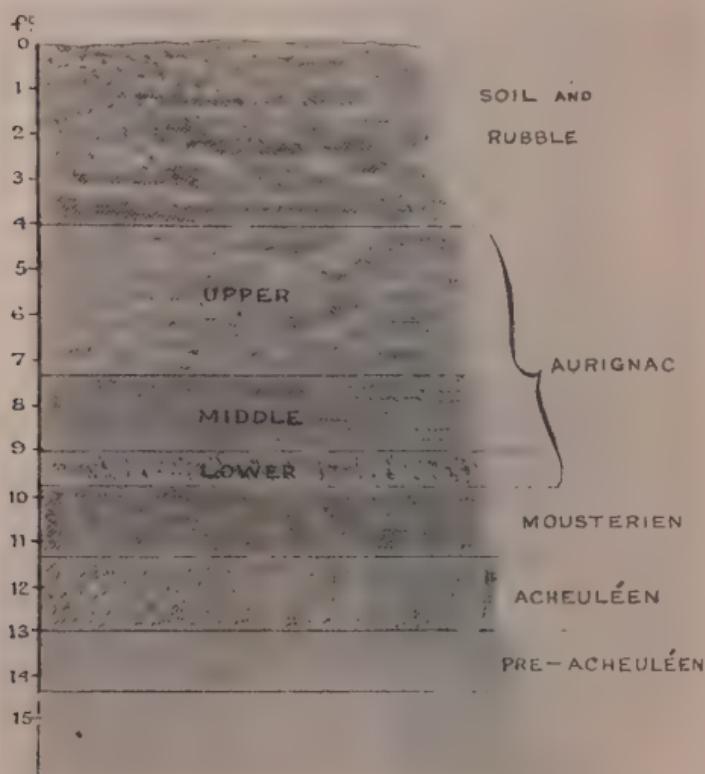


Fig. 22. Section of the strata in which the skeleton was found at Ferrassie.

Only a preliminary description of the last-named discovery has been published as yet by Professor Capitan, who, however, has given a very instruc-

NEANDERTHAL MAN IN FRANCE

tive sketch of the strata in which the skeleton was found. The deposits, which have been gradually and slowly formed by the wash of rain and the weathering of the face of the cliff, extend to a depth of 14·3 feet. The top stratum of soil and rubble, 4 feet in depth, contains no trace of human habitation; we may suppose it to have been formed after primitive man had abandoned rock-shelter habitations. The second stratum, 5·6 feet thick, contained many traces of man. From the character of the flint and bone implements, the engravings and the remains of animals, these strata are inferred to have been formed during the Aurignacien Period. Three stages in this period are recognized. In the oldest and lowest stratum of that period the Combe-Capelle man—of the Galley Hill race—was found. In the upper or most recent layer the Cro-Magnon race has left its traces. The Aurignac Period covers a long interval of time, and is usually regarded as part of the interval between the third or penultimate, and the fourth or last of the interglacial periods. Below the Aurignacien are the formations of the Mousterien Period. In the section given by Professor Capitan (Fig. 22) the deposits of the Mousterien Period are 1½ feet thick. The skeleton of Ferrassie was found at the bottom of this layer. Below the Mousterien were found the formations of the Acheuléen Period. These two periods, Mousterien and Acheuléen, are usually supposed

ANCIENT TYPES OF MAN

to cover the time which preceded and succeeded the third or penultimate cold cycle. In the deeper or older formations of the Mousterien Period, Hauser discovered the skeleton of the young man at Le Moustier; the skeletons found at La Chapelle-aux-Saints belong apparently to the close of the Mousterien Period. Remains found during the exhumation show that the reindeer was then in the south of France.

The young lad found at Le Moustier is a remarkable example of the Neanderthal type. The canine and wisdom teeth were in process of eruption, and the long bones had not ceased growing. He was probably about sixteen years of age, but already all the characters of his race were fully developed and well marked. The skull was particularly massive, having the dimensions of the Neanderthal skull and probably a somewhat greater capacity. The teeth are remarkably large; when fully grown his palate would have had almost exactly the same dimensions as those estimated for the Heidelberg man. The face was badly broken, and although indifferently restored we can see that it is very massive, its width and length being about an inch greater than in modern men. The characteristic supra-orbital ridge is present, and also the peculiar modification of the occiput to give attachment to the massive, bull-like neck. His height was under five feet. The remains of the young man are now preserved in

NEANDERTHAL MAN IN FRANCE

the Musem of Ethnology at Berlin. The price paid was a fabulous one, viz. 160,000 marks.

While the skeleton of Le Moustier gives us a glimpse of Neanderthal man in his youth, we have a picture of him in old age at La Chapelle-aux-Saints. The skull of the old man has a length of 208 mm., 3 or 4 mm. greater than any other known specimen of this type. It is very possible that in Neanderthal men, as among anthropoids, the supra-orbital ridges and muscular crests kept slowly growing all through life. Professor Boule estimates the cranial capacity at 1625 cubic centimetres—nearly 150 cubic centimetres above the average of modern Europeans, and the stature he calculates to have been 1600 (5 ft. 3 in.). As in the Le Moustier individual, so in this, the facial part of the skull was damaged; but even if damaged, the parts are welcome, for we knew very little of the face of Neanderthal man until these discoveries were made. The length of the face must have been more than an inch wider and longer than in modern man, while the neck was at least three-quarters of an inch more in thickness when measured from side to side and half an inch more when estimated from front to back. The teeth were worn and diseased in the old man of La Chapelle-aux-Saints; the molar teeth were lost during life, a condition we did not expect, for, as a rule, the teeth of an ancient man, although much worn, seldom show traces of disease.

ANCIENT TYPES OF MAN

Recently the teeth of Neanderthal man have been discovered in the Island of Jersey; they are similar in type to those of Krapina and Heidelberg. The teeth were found with remains of the woolly rhinoceros in the strata filling an old cave on the cliff of St. Brelade's Bay. Thus we have evidence that at a distant time, dating from almost the beginning to almost the end of the Glacial Period—a period variously estimated at from half to one and a half millions of years—Europe was occupied from the centre of Germany in the north to the Pyrenees in the south, from Jersey in the west to Croatia in the east, by a type of mankind quite unlike modern races. As yet we have only obtained a few glimpses of the men of this vast period. They appear suddenly and they seem to disappear without leaving a trace. A fuller knowledge will show how this remarkable race stands to modern man. In the writer's opinion the Neanderthal type represents the stock from which all modern races have arisen. At the first glance the native of Central Africa has little in common as regards build of body with the native of Central Europe, and yet an unprejudiced survey will show that, on the whole, the Negro and the European have a greater similarity in structure than either of these two has to the Neanderthal type. The extent of the difference between black and white indicates that the racial separation of the modern type of man must be placed far back

NEANDERTHAL MAN IN FRANCE

in time. Yet the Neanderthal type seems the parent stock, and it is probable that while Neanderthal man was the dominating race in Glacial Europe, another branch of the same stock was shaping towards the modern form outside the bounds of that continent.

Although no remains of the Neanderthal type have been found in a stratum which lies over or is more recent than one containing a representative of a modern race, yet there is evidence to support the theory that the Galley Hill type was contemporary with the Neanderthal type in Europe. No intermediate forms have yet been discovered in Europe or elsewhere. The transition from one type to the other appears to have taken place suddenly. In the course of a few thousand years Australia may offer a similar problem to the anthropologist. Research in that country would show at a distant date a sudden transition from one type of mankind to another. The sudden change we, who see the change taking place, know to be due to a replacement, not a transformation, of race. Glacial Europe was evidently the scene of a similar change of type; but in this case the change was greater than that now seen in Australia, for a very ancient species of man was replaced by what is here named the modern type.

In recent years we have come to know that the growth of the body is regulated, and its characters determined by internal secretions—especially by

ANCIENT TYPES OF MAN

the substances secreted from the thyroid and pituitary glands. The peculiar characters of the Neanderthal type appear to be under the particular domination of the small pituitary gland at the base of the brain. When this gland becomes enlarged, as it occasionally does in the disease known as acromegaly, the Neanderthal characters are developed in the subjects of the disease in an exaggerated and bizarre form. The functions of the pituitary seem to afford a key to Neanderthal characteristics. There are grounds for believing that, as our knowledge of the body increases, it may be possible to reproduce in modern man by experimental methods all the various features of head and body which characterize the Neanderthal type.

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CHAPTER XIII

GIBRALTAR MAN

NO specimen of the Neanderthal type has a more remarkable history than the Gibraltar cranium. In 1910 Colonel E. R. Keynon, then in command of the Royal Engineers, Gibraltar, discovered from the minute book of the long-defunct "Gibraltar Scientific Society" that this cranium was brought to light in 1848 and presented to the Museum of the Society by the Secretary, Lieutenant Flint. The Gibraltar cranium was thus the first discovery of the Neanderthal type of man, the famous specimen having been found nine years later, in 1857. The Gibraltar find is of the utmost value for two reasons—(1) the face and base of the cranium are better preserved than in any other specimen yet discovered; (2) because, at least in the opinion of the writer, it is of a more primitive type than any yet described, and appears to bridge the gulf between the ancient man of Java (*Pithecanthropus erectus*) and the typical Neanderthal man. It seems to be Early Neanderthal or Pre-Neanderthal.

In 1862 the cranium came to England with an

ANCIENT TYPES OF MAN

extensive collection of the remains of animals which had been excavated in the Genista cave at Gibraltar by Captain Brome, Superintendent of the Gaol. Captain Brome's patriotism on behalf of Science led to his being ignominiously and most unjustly dismissed the service because his pioneer discoveries had been made by the aid of prisoners under his charge. The collection which reached England under those inauspicious circumstances was examined and described by two remarkably skilled men—Mr. George Busk and Dr. Hugh Falconer. Both were struck with the human cranium. Falconer, observing that certain features distinguished it from the modern type of cranium, proposed to recognize it as a type of a new variety of mankind, and to name the variety *Homo Calpicus*—from Calfé, the old name of Gibraltar. In 1868 Busk presented the cranium to the Museum of the Royal College of Surgeons of England, where it is now preserved. It has received the attention of anthropologists from the days of Huxley, Broca, Quatrefages and Hamy to more recent days, when it has been studied by Macnamara, Klaatsch, Schwalbe, Sollas, and Sera. The point on which all are now agreed is that the *Homo Calpicus* belongs to the Neanderthal type of Pleistocene man.

All the evidence relating to the antiquity of this specimen is indirect. The only certain point is that it was quarried out of the terrace under

GIBRALTAR MAN

the north face of the rock, at a site then known as Forbes Quarry. The nature of the terrace we know ; the accompanying section from a recent paper by Mr. H. D. Acland will give a good idea

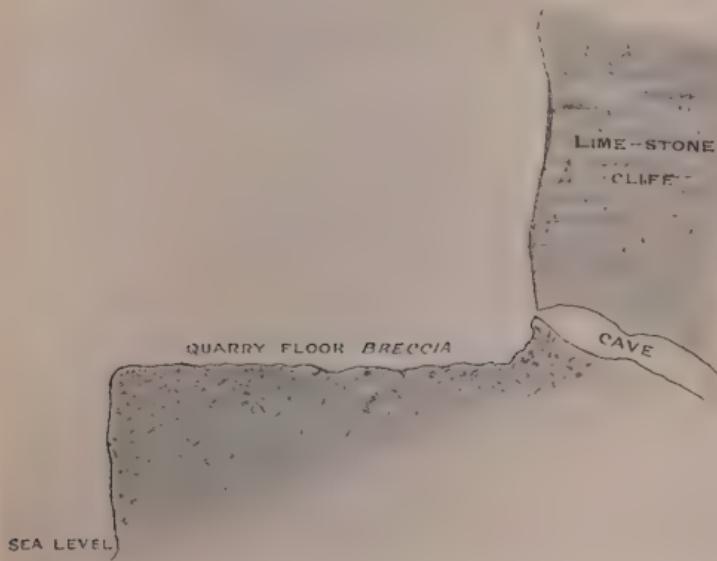


Fig. 23. Section of a talus or terrace at Gibraltar of similar formation to the one in which the famous skull was found. (H. D. Acland.)

of the terrace or talus formations at Gibraltar. The terrace is formed by weathering and erosion of the face of the limestone cliff ; the chips, which fall from the cliff, are welded together to form a conglomerate at the base. Mixed with the limestone chips is an addition of fine wind-blown sand

ANCIENT TYPES OF MAN

from the neighbouring shore. A petrified mass of sandstone breccia still fills the nasal cavities of the Gibraltar cranium. Its rock-like consistence defies removal. The part of the terrace in which the cranium was found was probably at a former period the floor of a cave. Part of a cave still exists behind the site of the discovery. The floor of this cave was explored by Dr. W. H. L. Duckworth, of Cambridge, in 1911; he found ten successive layers of stalagmite, and a layer of breccia or conglomerate $4\frac{1}{2}$ feet thick on the floor. No fossil remains were discovered by him. The terrace formation is of the same nature as the cave strata of the Dordogne, but it is impossible at the present time to find the exact geological period. It is certainly a Pleistocene formation, and very probably older than the cave strata in the Dordogne assigned to the Mousterien Period. Professors A. C. Ramsay and James Geikie, who investigated the geology of Gibraltar in 1877, saw evidence of a cold period in these terrace formations of breccia. The fauna found in the Genista cave by Captain Brome and described by Busk and Falconer, is very similar to that found with the Heidelberg jaw in the sands of Mauer. *Rhinoceros Etruscus* was present as at Mauer, and the fauna indicates an early part of the Pleistocene Period. In a cave at Gibraltar Dr. Duckworth found stone implements of the type used in France during the Mousterien Age.

GIBRALTAR MAN

The geological evidence permits one to say that the conditions of life at Gibraltar at the beginning of the Pleistocene Period were such as make it probable that man may have lived there then. The real evidence of antiquity must be sought for in the skull itself. The cranial capacity is under 1100 cubic centimetres—200 to 300 less than in the examples of Neanderthal man found elsewhere with the possible exception of one Krapina specimen. Although the size of the brain has not shown a progressive increase with evolution, still we must regard a small brain cavity in a primitive type of skull as an indication of antiquity. The total length of the skull is 192 mm., the brain making up 164 mm. of this amount. In the Neanderthal skull the total length was 203 mm., with a brain length of 175. The proportion of the thickness of bone is therefore greater than in the Neanderthal skull. The width of the Gibraltar brain is 130 mm., the skull 142. The width or cephalic index of the skull is thus 74 per cent of the length. There is a slight indication of the brachycephalic character as seen in Krapina crania. It is, however, in the cerebral height that the primitive nature of this skull is evident. The height, according to the writer's method of measurement, is only 88 mm., 10 to 15 mm. less than in the other Neanderthal crania, with the possible exception of some of the Krapina fragments.

The writer was at first inclined to explain the

ANCIENT TYPES OF MAN

diminutive size of the Gibraltar cranium on the supposition that it was that of a woman, a suggestion first made by Professor Sollas, but further investigation of the characters of the jaw, and

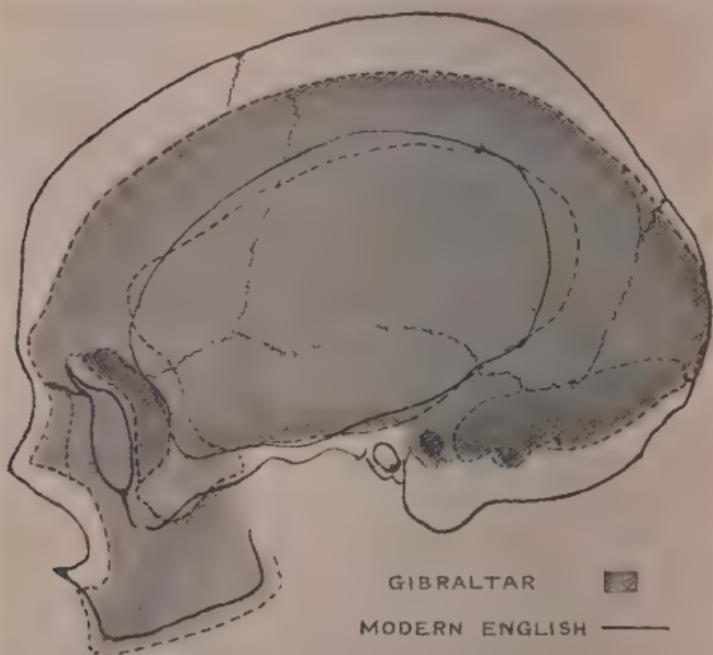


Fig. 24. Profile of the Gibraltar cranium (shaded) compared with modern English skull (outline). (One-third natural size.)

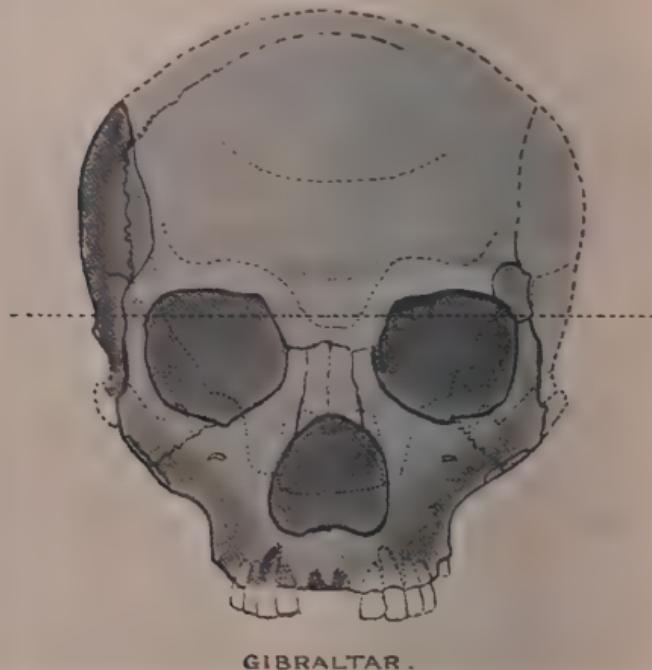
teeth, and face, and especially a critical survey of the sexual differences seen in the fragments of the Krapina crania, compelled him to abandon the sexual explanation and adopt that of antiquity. The characters of the teeth are remarkably

GIBRALTAR MAN

primitive. The upper molars, which are worn almost to the roots and broken, have characteristic roots. They are widely spread and united together almost to their tips. Their crowns, as in the Heidelberg mandible, are not large. The first upper molar when measured from front to back along the line of the alveolus, is 11.5 mm., the second 10.5 mm., and the last is as large as the first—very probably larger, for we can only judge of its size from the space occupied by the roots. The necks of the teeth were as large or larger than the crowns. The length of the palate is only 54 mm., certainly shorter than the Heidelberg palate; its width is 70 mm., the same measurement as was estimated for the Heidelberg palate. The dimensions of the face are moderate in amount, the extreme width from one zygomatic arch to the other was probably 134 mm.; the length of the face from the root of the nose to the gum between the upper incisors, 81 mm. In the La Chapelle skull these dimensions are 10 mm. ($\frac{2}{3}$ in.) greater. The characters of the face of the Gibraltar skull are primitive; a number of its features recall the corresponding parts of the gorilla. The bridge of the nose in its length and breadth and the manner in which the root bends upwards into the supra-orbital ridge, are more like the gorilla form than is the case in any other cranium of the Neanderthal type. The air sinuses in the upper jaw are inflated to almost the

ANCIENT TYPES OF MAN

same extent as in the gorilla. The orbits are capacious, as is the case in all crania of the Neanderthal type and also in the gorilla, but in the form of palate there is no resemblance to the great



GIBRALTAR.

Fig. 25. Face view of the Gibraltar skull.
(One-third natural size.)

anthropoid. The projecting muzzle of the gorilla is replaced by the backwardly compressed and wide upper jaw of the Neanderthal type. One feature of the face is rather surprising. The aperture of the nose is bounded by a sharp margin

GIBRALTAR MAN

very similar to the form seen in modern man. The prenasal grooves, seen in the floor of the nasal aperture of anthropoids, of Negroid races, and of the other known specimens of Neanderthal man, are absent. Yet the aperture is extremely wide,

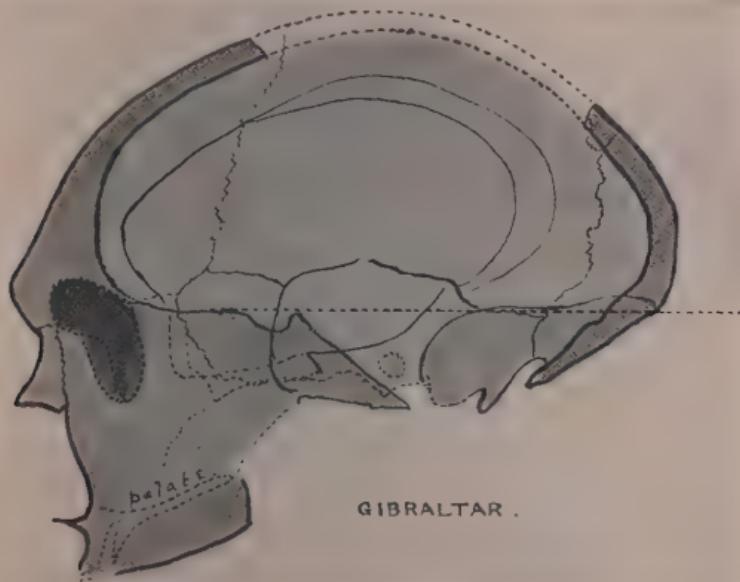


Fig. 26. Profile of Gibraltar skull. (One-third natural size.)

namely, 34 mm. In the Gibraltar skull one seems to have a foreshadowing of the prominent European nose. Were the air sinuses which puff out the regions of the nose and cheek to collapse to modern dimensions, the narrow and prominent European nose would be produced. The type of

ANCIENT TYPES OF MAN

nose seen in the Gibraltar cranium could hardly be the forerunner of the Negro type. Further evidence of the primitive nature of the Gibraltar skull is seen in its flat cranial base, which has been studied closely by Dr. Sera. Another primitive feature is the diminutive size of the squama of the temporal bone; it takes but a small part in forming the cranial cavity. On the other hand, the great wing of the sphenoid is massive—a feature which Professor Klaatsch observed to occur in all crania of the Neanderthal type.

Taking all the evidence into account the anatomical features of the skull, the Pleistocene fauna of Gibraltar, and the formation of the terrace in which the cranium was discovered we may regard the human race known to us only by this single cranium, as a very early form of Pleistocene man. The race was certainly of the Neanderthal type, but appears to be an earlier and more primitive form than the typical specimens discovered in Belgium and France.

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CHAPTER XIV

FOSSIL MAN OF JAVA -*PITHECANTHROPUS ERECTUS*

THE Gibraltar skull serves in some degree to bridge the gulf between the Neanderthal type of Europe and the remarkable type of man discovered in Java by Eugene Dubois, now Professor of Geology in the University of Amsterdam. Professor Dubois was trained under that veteran Dutch zoologist, Professor Max Weber, and went out to Java in 1889 as a military surgeon. At the request of the Governor-General of Java he explored the fossil bed of Trinil, a native hamlet in the Province of Madiun, near the centre of Java. That province is known, on account of its tropical heat, as the "Hell" of Java. Through Madiun, bending northwards to the sea, meanders the Solo or Bengawan, a stream which has cut its banks to a depth of 35 to 40 feet, thus exposing the strata of the plain. The upper 35 feet are composed of the consolidated débris of lava washed from the hills and deposited on the plain by the Bengawan during the Pleistocene Period. Under the thick strata of volcanic débris is a layer

ANCIENT TYPES OF MAN

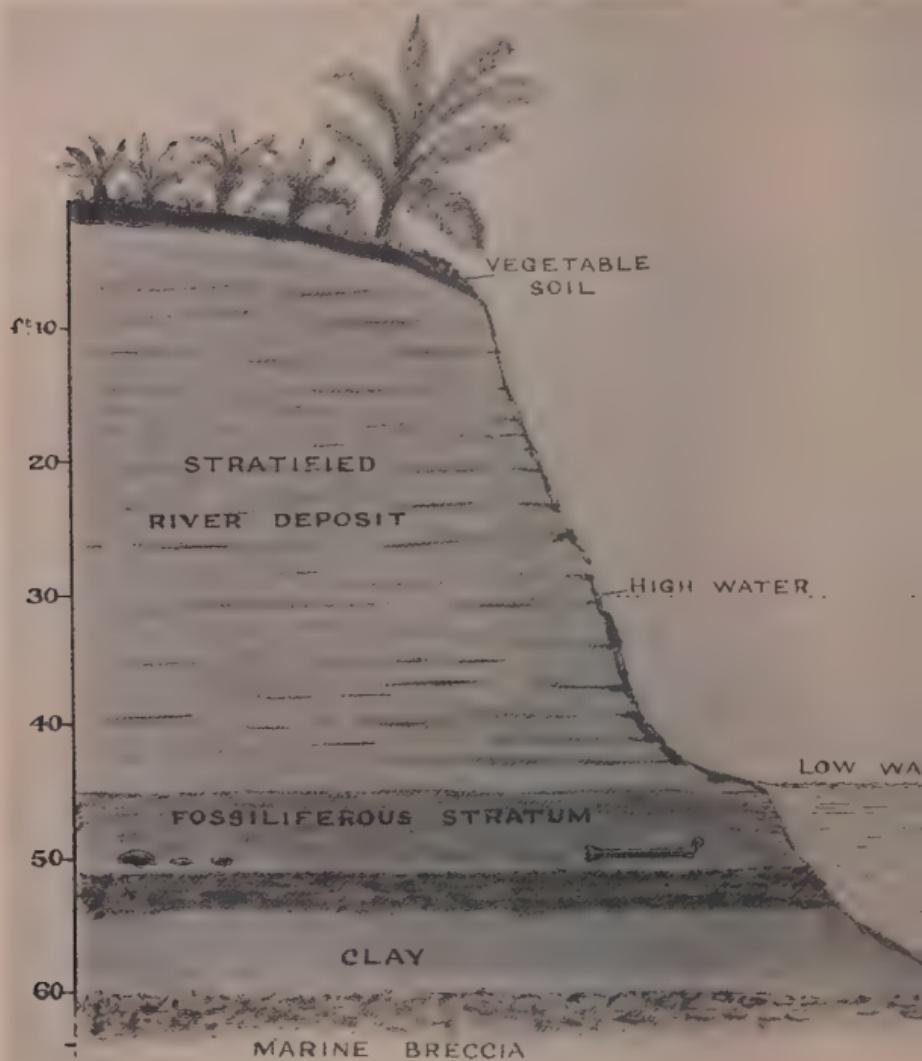


Fig. 27. Section of the bank of the Bengawan, showing the position of the fossil-bearing stratum in which the remains of the fossil man were found.

FOSSIL MAN OF JAVA

which may be regarded as a sepulchre for a past fauna of the island. During 1891 and 1892 Professor Dubois discovered in this deep fossiliferous stratum the remains of twenty-seven species of mammals, belonging to twenty genera. Amongst these fossil remains of a long-past fauna were four specimens—a skull cap, a thigh bone, and two teeth—which he assigned to an extinct animal. To this extinct form he gave the name of *Pithecanthropus erectus*. He regarded it as a link which bridged the gulf between man and anthropoids. In a zoological sense the name is justified, but so many are the human characters and so strong is the suggestion that in this discovery of Dubois we have a representation of an actual stage in the evolution of man, that it seems more expedient to simply give the name of *Homo javensis*, or the fossil man of Java.

It is highly desirable to fix the date of the Java type of man and see how he stands as regards the earliest known form of the Neanderthal type. The Heidelberg man, it will be remembered, is assigned to an early part of the Pleistocene Period; Dubois regarded the Trinil fossil fauna as of older date, belonging to the end of the previous or Pliocene Period. To fix with greater certainty the date of the Trinil fauna, Frau Lenore Selenka, the widow of Professor Emil Selenka, who did so much to extend our knowledge of the Higher Primates, led an expedition to Java in 1907-8.

ANCIENT TYPES OF MAN

In the opinions of the experts who examined the fossils excavated by the expedition, the Trinil fauna, including Pithecanthropus, is Pleistocene—of the same date or perhaps even later than the Heidelberg man. The difficulties of fixing the relative dates of a fauna of a tropical country such as Java with that of a temperate country, which, like Central Europe, has been subjected to many changes in climate, in the scale of geological time, are very great. It is true that the strata which succeeded the fossil-bearing layer of Trinil shows a flora of a temperate climate, but a temperate climate in volcanic Java is more likely due to a great elevation of the island than to such a change of climate as Pleistocene Europe was subjected to. In the writer's opinion Dubois was right; the Trinil fauna, judging from the changes in the mammalian forms, is as old as the Pliocene of Europe, and is earlier than the sands of Mauer. Whatever the exact date may be, whether late Pliocene or early Pleistocene, the characters of the femur leave no doubt, in spite of minor peculiar features, that the fossil man of Java was as completely adapted for erect posture and erect progression as the man of to-day. There are no features in it which suggest the slouching gait of Neanderthal man. It is part of a slim animal, human in shape and in movement, who stood, on the present method of reckoning stature, about 5 ft. 6 in. high. The length of the femur is 455 mm.;

FOSSIL MAN OF JAVA

it shows a bony growth, pathological in nature, into the muscles of the thigh. The erect posture, as one had good reason to suspect, even before Dubois had made his important discovery, was evolved before the end of the Pliocene Period.

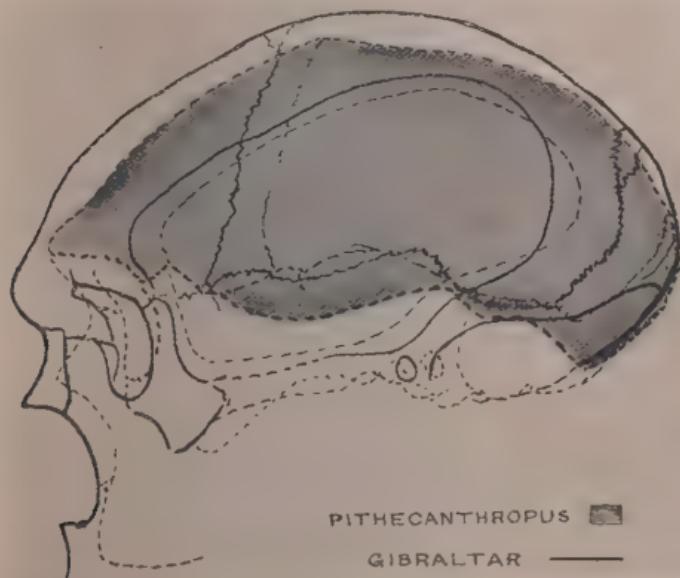


Fig. 28. The profile of the calvaria of the fossil man of Java (shaded) compared with the Gibraltar cranium (outline). (One-third natural size.)

The modern human posture was attained long before the human brain reached its modern size.

The brain is the characteristic organ of man. Dubois estimated that of the fossil man of Java at 855 cc., but it is highly probable

that the estimate is somewhat under the truth. In the Gibraltar skull the capacity is about 1080 cc., an amount which exceeds some modern aborigines of Australia. On the other hand, in crania of the Neanderthal type the capacity equals or exceeds the modern average of 1475 to 1500 cc. The capacity of the Java skull is intermediate to that of the gorilla—the male anthropoid of that genus may be as much as 600 cc.—and the capacity of the Gibraltar skull (1080 cc.). If we accept the Java specimen as representative of late Pliocene man, then we must admit that the human brain was then in its more primitive stages of development. When one bears in mind the remarkable discoveries by Mr. J. Reid Moir of worked flints, the products of human hands and human brains, in the undisturbed crag formations of the east of England—formations which mark the transition of the Pliocene to the Pleistocene Periods, and the remarkable size of the brain of Neanderthal man, one is compelled to believe that the human brain had attained a greater size than that of the Java man at the end of the Pliocene Period. Either he is of older date than we now think, or he was, as we may see in the world to-day, the surviving remnant of an old form amongst progressive human cousins. Even if the primitive Java man had persisted to a period when the ancestral race of modern man had passed far beyond him, that does not in any

FOSSIL MAN OF JAVA

way invalidate his claim to represent a stage in human evolution.

Frau Selenka's expedition discovered three pieces of evidence in favour of man, as we now know him, having been a contemporary of the Java man. These are (1) in the fossiliferous layer at Trinil, charcoal and signs of fire were found. The fire may have been kindled by man—or it may have been, as it sometimes is now in Java, of volcanic origin. (2) Certain of the fossil bones were splintered. They may have been splintered by man, by crushing in the bed of the river, by carnivorous animals or by heat. (3) A fossil tooth was found in the bed of a neighbouring stream, which Dr. Walkoff rightly regards as human in character. It is a third lower molar, 13 mm. in length and 11 mm. in breadth. Dr. Walkoff is probably right in regarding it as the earliest trace of man's body yet discovered, but in the writer's opinion every feature of that tooth is just what is to be expected in the third lower molar of the fossil man of Java. Dr. Walkoff, however, regards it as evidence of the contemporary existence of a modern type of man. It will thus be seen that the existence of the modern type of man as a contemporary of the Pliocene man of Java is founded on very slender evidence. The facts are most easily explained by supposing that the charcoal and the splinters are not of human origin, and that the tooth is that of *Pithecanthropus*.

ANCIENT TYPES OF MAN

An analysis of the dimensions and form of the Trinil skull cap reveals all the characters of the Neanderthal type in a nascent or rudimentary condition. It represents a stage in the evolution of the human head considerably below the earliest stages yet found in Europe. The maximum length of the skull in Java man was certainly 185 mm., equal to the same diameter of a modern man, but the component parts of the length are very different. In the Java man the brain made up 155 mm. and the frontal and occipital walls of the skull the remainder, namely, 30 mm., which is equal to 16.2 per cent of the total length. In a modern European, with the same length of head, the thickness of the skull wall accounts for only 8 per cent of the total length ; in the Gibraltar and Neanderthal skulls the proportion of bone is 14 per cent ; in the gorilla it is 20 per cent. In the evolution of man the length factor due to the brain gradually increases, while that due to thickness of skull wall gradually decreases. As regards width of skull the Trinil man also falls within human dimensions ; the greatest width was certainly 135 mm., with a brain width of 7 mm. less. The width index as regards the length of skull is 72.5 per cent ; as regards the brain, its width is 82.6 per cent of its length. As in anthropoids, the roundness of the brain is masked by a long cranial case. The Java man shows in a marked degree the flattening of the brain and skull from above

FOSSIL MAN OF JAVA

downwards—a feature of the anthropoid and also of the Gibraltar man. The cerebral height of the Java skull, on the author's method of reckoning, is 79 mm., 13 mm. more than in the male gorilla, 9 mm. less than in the Gibraltar cranium, and 20 mm. less than is common in modern man and in typical specimens of Neanderthal man. In the particular method by which the skull was hafted to the neck—causing the high position of the inion—the Java man shows the same features as the Neanderthal type of Europe, only these features are even more exaggerated. Thus the Java man represents in his skull a pre-Neanderthal condition—just such a one as we should expect in Pliocene man.

Professor Dubois' discovery also throws a clear light on the evolution of the human mechanism of mastication. From the markings and form of the skull and from the characters of the two teeth found—a last upper molar and a second lower premolar—there can be no doubt the method of mastication and form of palate and dentition were similar to those seen in the Neanderthal type of man. The retrogression of the canine teeth and the evolution of the human mechanism of dentition have to be sought for at an earlier stage of human evolution than that represented by *Homo javanensis*. The size of the palate and form of the face were probably not unlike the condition preserved for us in the Gibraltar cranium.

ANCIENT TYPES OF MAN

From a survey of this extinct form of man we can draw the important inference that our teeth and our posture were evolved at a stage when our brain, as regards volume and shape, had passed through only the earlier stages of the development which has lifted it above the anthropoid condition. Although the geological evidence points to a late Pliocene or early Pleistocene Period for *Homo javensis*, his physical characters are best explained by assigning him to an older period—one nearly at the beginning of the Pliocene Period.

REFERENCES.—Prof. Eugene Dubois: “*Pithecanthropus Erectus, eine menschen.*” *Uebergangsform aus Java.* Batavia, 1894.

Prof. G. Schwalbe: “*Studien ueber Pithecanthropus Erectus.*” *Zeitschrift für Morph. und Anthropol.*, 1899, Bd. 1, pp. 16–240.

CHAPTER XV

ANCIENT TYPES OF AMERICA

HAVING traced the various types of man that have appeared in the Old World, from the Neolithic woman of Essex to the very ancient fossil man of Java, I propose to turn to the New World and survey briefly the most ancient kinds of man which have been discovered there. So far as concerns North America the task is an easy one, for only the other day the American Bureau of Ethnology issued a very clear account, written by Dr. Ales Hrdlicka, of the remains of ancient man which have been found there. There is no final agreement amongst American geologists, any more than amongst their European colleagues, as to the exact number of temperate intervals which broke up the long glacial epoch into periods ; in America it is usual to recognize five such intervals, the present temperate period being the sixth. We have just seen that in the Old World remains of man have been found from about the beginning of the first Interglacial Period assigning, in our calculations, the first of the cold periods to the end of the Pliocene Period. No remains of the body of man have yet been found in North America

in circumstances which permit us to assume that they belong to an earlier point than a late date in the present temperate period. Mankind appears to have attained its modern form long before America was first inhabited. Of the fourteen discoveries recorded by Dr. Hrdlička, probably the "Nebraska loess men" have the greatest claim to antiquity. Parts of about twelve human skeletons were found. The first find at Nebraska was made in 1894; but it was not until Mr. G. F. Gilder undertook a systematic excavation and found human bones at a depth of 7 feet in an apparently undisturbed and naturally formed stratum that attention was drawn to the importance of the Nebraska find. The scene of the discovery was Long's Hill, a ridge-like elevation some six hundred yards in extent, composed of a fine loam mixed with lime, a formation made in late Pleistocene times by wind and rain. On the top of the hill was an old burial mound in which the upper human remains were found; the deeper remains were unearthed beneath the mound in loess which had been apparently deposited naturally over the remains. In Dr. Hrdlička's opinion the remains were those of a people having the same features as are still to be found amongst Indian tribes. As regards time it is possible that the "Nebraska loess man" may have been a contemporary of the Tilbury man in England, but his date is probably much later.

ANCIENT TYPES OF AMERICA

Another find may be mentioned. In 1902 Mr. M. Cannon, a farmer near Lansing, Kansas, dug a tunnel into a terrace at the base of the Missouri River bluffs. He was surprised to find, at a depth of 20 feet below the surface, the skeleton of a man, and a part of the lower jaw of an infant. The terrace, however, is apparently of comparatively recent formation, having been probably laid down by the stream issuing from the side valley. The age is probably not greater than that assigned to the Nebraska remains. Perhaps the most famous of the remains of prehistoric man found in America is the Calaveras skull. This was discovered by a gold miner, near Altaville, California, in 1866. The bed of gravel in which this skull is said to have been found lies 130 feet beneath the surface, and in the opinion of those fit to judge, was formed at a period of the earth's history which antedates the appearance of the fossil man of Java by a long interval of time. The Calaveras skull is of the modern human type, characterized by the very prominent cheek bones usually found in the Mongolian races. The discovery of a modern aeroplane in a church crypt which had been bricked up since the days of Queen Elizabeth would form a parallel instance to finding a modern human skull in a Miocene formation. To those who have studied the evolution of man, the one discovery is as credible as the other. Dr. Hrdlicka found the same type of skull

ANCIENT TYPES OF MAN

in a similar state of fossilization in the limestone caves of Calaveras county. In some manner one of these had got mixed with the deep gold-bearing bed of gravel.

Dr. Hrdlička formed the opinion that the skeleton discovered at Lansing "is practically identical with the typical male skeleton of a large majority of the present Indians of the Middle and Eastern States." As regards the man of the "Arkansas loess," he also is of the Indian type, but there are certain peculiar features, namely, a low forehead which slopes backwards to a high crown. The top, or crown of the head, reaches its maximum elevation towards the posterior part of the head.

It is a remarkable fact that the oldest type of man yet discovered in South America is the same as the man of the Arkansas loess. The discovery was made when excavations were being carried out to form the docks at Buenos Aires, on the south bank of the La Plata. When the workmen had reached a depth of 35 feet below the present bed of the river and over 100 feet below the level of the neighbouring plain, they found part of a skull, including the forehead and part of the crown. In Professor Schwalbe's opinion, with which the writer is in complete agreement, the skull is, both as regards its dimensions and its character, that of a modern type of man—the type just mentioned in the Arkansas loess. In the opinion of that enthusiastic pioneer of Palæon-

ANCIENT TYPES OF AMERICA

tology in South America, Professor Ameghino, the skull thus found is that of an ancestral form of

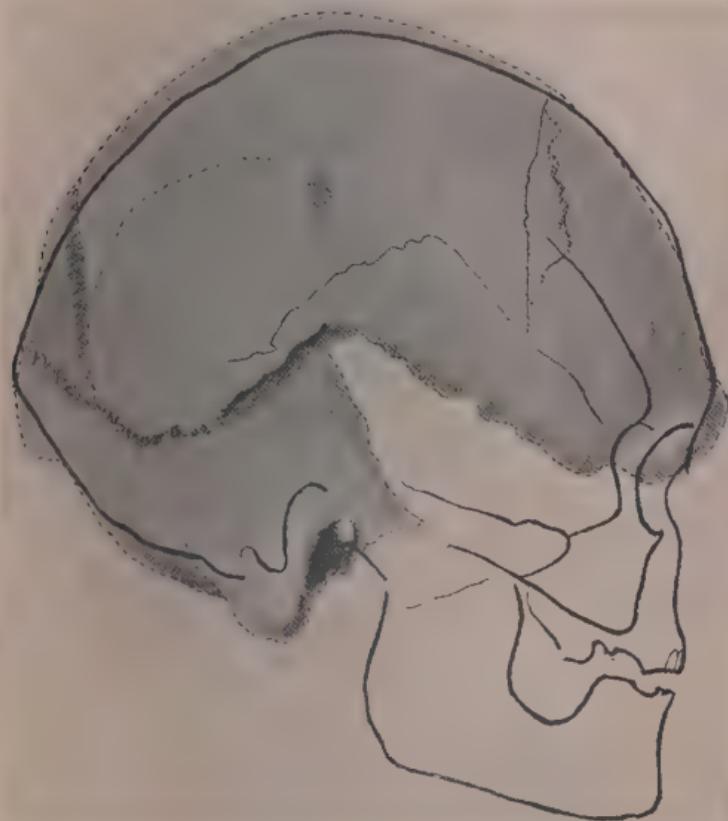


Fig. 29. A tracing of the profile of the La Tigra cranium (outline) compared with the profile of the skull of the Arkansas loess man (shaded). (One-third natural size.)

man to which he gave the name *Diprothomo platensis*. The same authority assigns an extra-

ANCIENT TYPES OF MAN

ordinary antiquity to the La Plata man, placing him near the beginning of the Pliocene Period, a million or two years old. Our attempt to give the modern type of man an antiquity of 200,000 or 300,000 years is modest when compared to Professor Ameghino's estimate.

In forming an opinion as regards the age in which the 35-foot stratum of the La Plata bed was formed, one must keep in mind the many oscillations in the level of the land which occur in the South American continent, and also the volume of silt, and consequent land formation, brought down by such a river as the La Plata. We have every reason to suppose that land is of rapid formation in the estuary of the La Plata. If 30,000 years is assigned to the stratum in which the Tilbury man was found, half that amount would be a liberal estimate for the layer in which the La Plata man was discovered, for the Thames is small and its valley steadfast, compared with the great rivers of South America. It is true that Professor Ameghino found extinct forms of South American animals in strata superficial to the one in which the remains of man occurred, but there is every reason to believe that such forms survived well into the present period. A human vertebra, the first or atlas on which the skull rests, has also been discovered at Monte Hermosa within the La Plata watershed, in a stratum which Professor Ameghino regards as

ANCIENT TYPES OF AMERICA

even older than Pliocene; but this bone, like the crania deposited in the estuary of the river, is of the form met with in modern man.

The skull found during the excavations for the docks is so fragmentary that its complete form cannot be determined with certainty; but fortunately, in a formation which Professor Ameghino regards as also Pliocene, yet more recent than the 35-foot layer at the docks, a complete skull (the La Tigra cranium, Fig. 29) was found. It belongs to the race which Professor Ameghino has named *Homo Pampaeus*. How closely this skull resembles that of the man of the Arkansas loess will be seen at once in the accompanying figure where the outline of *Homo Pampaeus* is traced on Dr. Hrdlička's accurate drawing of the skull of Arkansas man. Not only are the skulls almost of the same size and shape, but they are both cast in a mould so similar that we cannot doubt we are dealing with individuals of the same race although found more than 4000 miles apart. Both are of an Indian type, and have reached a point of physical development which is seen in the Neolithic races of Europe. The teeth, the jaws, and the shape of the long bones are similar in the types of the East and West.

The date at which man appeared on the American continent is a puzzling problem. The very oldest type yet known is very modern. Yet we know that for thousands of years before he

ANCIENT TYPES OF MAN

appears to have reached America he was already present and widely distributed in the Old World. The late date of his appearance in America is not easy of explanation, nor is the earliest type known—the La Plata or Arkansas type—easily placed in the scale of Old World races. There are peculiar features which recall the Mongol to some degree and others which resemble those of the fairer skinned inhabitants of the Pacific. The cradle and affinities of the American Indians have still to be discovered.

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INDEX

Acheuléen Period, 115
Acromegaly and Neanderthal type, 120
Ameghino, Professor, *et seq.*, 145
America, ancient types of Man in, 141
Aurignacien Period, 53, 69, 96, 115
Bengawan river, section of bank of, 132
Boule, Professor, 113, 117
Brünn, 46
Brünn crania, No. II, 51
Brünn Man, 47
 Art of, 47, 48
 Teeth of, 50
Brüx skull, 57
Busk, Mr. George, 122
Calaveras skull, 143
Capitan, Professor, 114
Combe-Capelle, 51
Combe-Capelle Man, 53
Corner, Mr. Frank, 31
Cro-Magnon race, 26, 64, 71
 Art and weapons of, 69
 Bones of, 72
 Civilization of, 69
Dartford cranium, 66, 67
Dartford Man, 22
Diprothomo platensis, 145
Dordogne, 64, 66
 Stratification of terraces of, 52
Dubois, Professor Eugene, 131
Duckworth, Dr. W. H. L., 124
Dupont, M. Ed., 75
Elliott, Mr. Robert, 23
Engis cave, 56
Engis skull, 56, 109
Essex Woman, 1, 7, 8
 Teeth of, 7
 Bones of, 6, 9
Falconer, Dr. Hugh, 122
Ferrassie skeleton, 114
Forbes Quarry, 123
Fraipont, Professor, 111
Furlooz race, 75, 76
Galley Hill, 28
Galley Hill Man, 28, 103, 104, 105
 Bones of, 32, 33
 Brain of, 34
 Teeth of, 37, 40, 41
Galley Hill race, 46, 47, 48, 49, 50, 54, 56, 57, 58, 60, 61, 67, 69, 119
Galley Hill skull, No. II, 41, 42

INDEX

Gibraltar skull, 99, 121 *et seq.*
Antiquity of, 122, 125
Characters of face of, 127
Importance of, 121
Teeth of, 126, 127

Gorjanovic-Kramberger, Professor Karl, 94

Grenelle, 75

Grimaldi cave, 59

Grimaldi skeletons, 59

Grotte des Infants, 59

Hamy, 75

Hauser, Herr O., 51, 113

Hayes, Mr. Matthew, 41

Heidelberg Man, 78, 79 *et seq.*
Teeth of, 84, 86, 87

Heidelberg skull, reconstruction of, 89, 90, 91, 92

Hinton, Martin A. C., 20

Homo pampaeus, 147

Hrdlička, Ales, 141, 148

Huxley, Professor, 19, 20, 102, 105

Inion, position of, 105

Java, antiquity of fossil remains of, 134
fossil man of. *See* Pithecanthropus
fossil remains of, 133

Klaatsch, Professor, 49, 54, 111, 113, 130

Krapina, 94

Krapina Men, 94 *et seq.*
Implements of, 95, 96
Teeth of, 98

Krapina race, women and children of, 98

Krapinica, 94, 95

La Chapelle-aux-Saints, 113
Skeleton, 113, 117

La Madeleine, 69

La Naulette, 109

La Plata, ancient remains of, 144

La Tigra cranium, 145

Langwith cave, 20

Lansing remains, 143

Le Moustier, 113
Skeleton, 113, 116

Lohest, M., 111

Magdelénien Period, 69

Makowsky, Professor, 48

Mandible, modifications of, for speech, 83

Mastication, change in, 8

Mauer, fauna of sands of, 81
Sands of, 79
Stratification of sands of, 81

Mentone, caves near, 59, 71

Mousterien Period, 96, 115, 116

Mullins, Rev. E. H., 20

Neanderthal, 101

Neanderthal Man, 101 *et seq.*
Bones of, 106, 107
Teeth of, 118

Neanderthal race, 78, 79, 101, 118, 119, 122
Brain of, 93, 105

Nebraska loess Man, 142

Negroid type, 60, 61, 62

Newton, Mr. E. T., 31

Newton, Mr. W. M., 24, 25

Owen, Sir Richard, 13

INDEX

Palate and jaws, changes in, 88
Parsons, Mr. F. G., 6, 17, 35, 37
Pithecanthropus, 121, 131, 133
et seq.
 Capacity of skull of, 136
 Teeth of, 139
Quatrefages, Professor, 75
River-bed type, 20, 21, 24, 37, 46, 75
Round-headed type, 74, 75
St. Brelade's Bay, Teeth discovered at, 118
Schaafhausen, Dr., 101
Schmerling, Professor, 56
Schoetensack, Professor Otto, 80
Schwalbe, Professor, 57, 78, 102, 144, 148
 Remains in S. America, 144, 148
Schweizersbild, remains found at, 21
Schwartz, Dr. F., 21
Sera, Dr., 130
Sikhs, 71
Sollas, Professor, 126
Solutre, 75
Solutréen Period, 53, 69
Spy, 110
Spy men, 110, 111
 Civilization and fauna of, 111
Supra-orbital ridge, 92, 104
Tasmanians, teeth of, 40
Teeth, retrogression of, 40, 41, 85
Thames-bed, Stratification of, 10, 11, 12, 13, 22
Thames Valley, fauna of, 26, 30, 44
 Terraces of, 23, 24, 26, 28, 29, 30
Tilbury Man, 10 *et seq.*
 Age of, 12
 Teeth of, 19
Trinil, 131
Verneau, Dr., 60
Vézère, 51, 64
Walton-on-Naze, 1
Warren, Mr. Hazzeldine, 2, 3
Wilde, Jonathan, 15, 16, 17, 35

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